



Beginner to Pro in Excel: Financial Modeling and Valuation

365  Careers

II. Excel's functions

Index

	Page #
If	4-7
Sum functions	8-13
Count functions	14-20
Lookup functions	21-33
Index & Match	34-40
Average & Averageif	41-44
Iferror	45-48
Text functions	49-57
Choose	58-63
Goal Seek	64-68
Data tables	69-74
Pivot tables	75-82

If

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number Styles

PMT X ✓ fx =IF(

1 If 1 2 3

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79
Total				

1 If tests to see whether a certain condition is true or false...

2 ...the Excel user selects as a second argument of the function the value to be displayed if the condition is TRUE

3 ...the Excel user selects as a third argument of the function the value to be displayed if the condition is FALSE

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard: Paste, Cut, Copy, Format Painter

Font: Arial, 9, Bold, Italic, Underline, Color, Background Color

Alignment: Wrap Text, Merge & Center, Left, Center, Right, Indent, Decrease Indent, Increase Indent

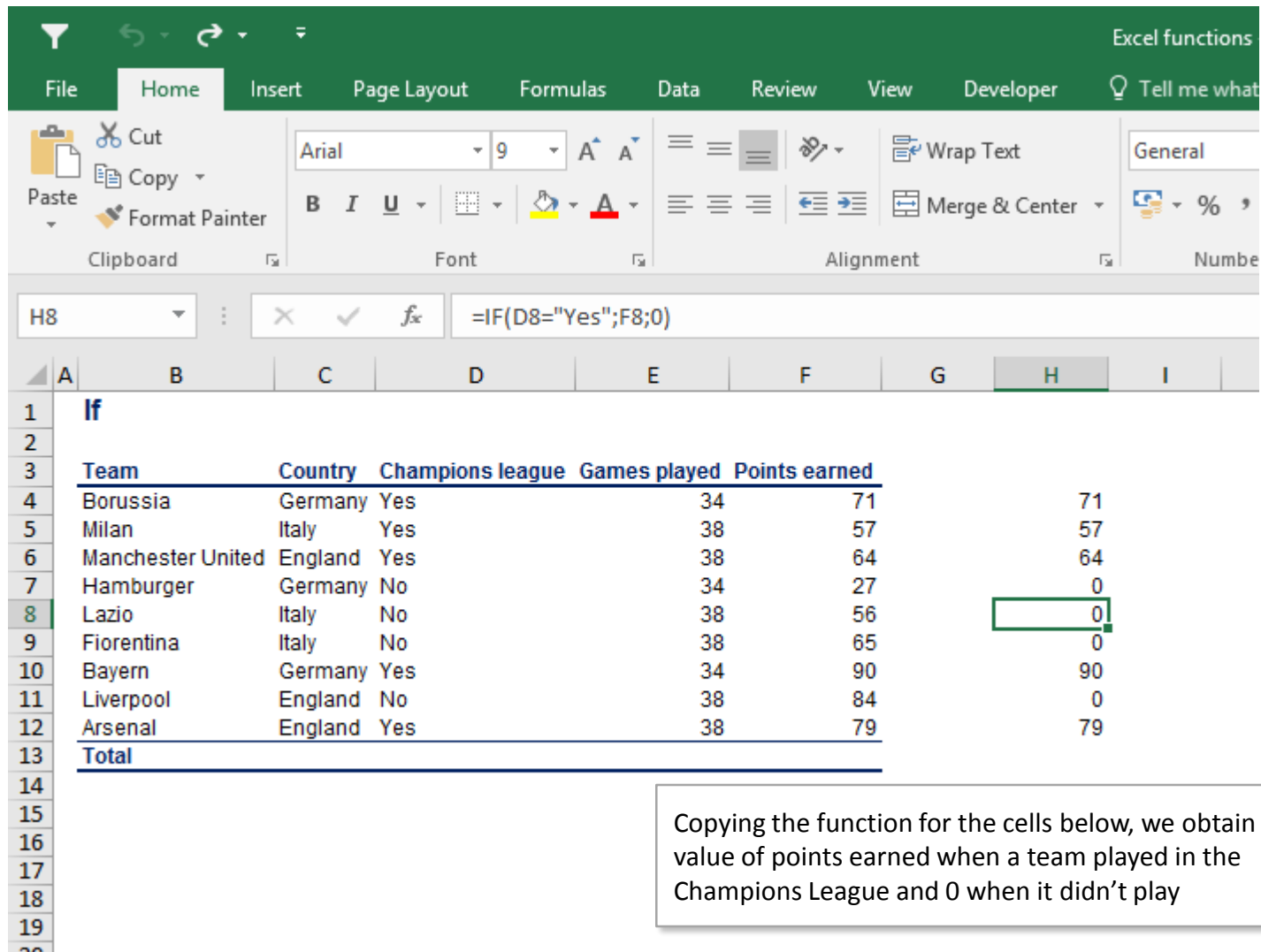
Number: General, Percentage, Decimal, Fraction, Text, Scientific, Custom

Formula Bar: H4, =IF(D4="Yes";F4;0)

	A	B	C	D	E	F	G	H	I	J	
1	If										
2											
3		Team	Country	Champions league	Games played	Points earned					
4		Borussia	Germany	Yes	34	71		71			
5		Milan	Italy	Yes	38	57					
6		Manchester United	England	Yes	38	64					
7		Hamburger	Germany	No	34	27					
8		Lazio	Italy	No	38	56					
9		Fiorentina	Italy	No							
10		Bayern	Germany	Yes							
11		Liverpool	England	No							
12		Arsenal	England	Yes							
13		Total									
14											
15											
16											
17											
18											
19											
20											

Above we have the following:

- 1) The condition is that D4 is "Yes", which is True
- 2) The formula should display the value in F4 when True
- 3) The formula should display 0 when the condition is False



The screenshot shows the Microsoft Excel interface with the 'Home' tab selected. The formula bar displays the formula `=IF(D8="Yes";F8;0)` for cell H8. Below the formula bar, a table is visible with the following data:

	Team	Country	Champions league	Games played	Points earned
4	Borussia	Germany	Yes	34	71
5	Milan	Italy	Yes	38	57
6	Manchester United	England	Yes	38	64
7	Hamburger	Germany	No	34	27
8	Lazio	Italy	No	38	56
9	Fiorentina	Italy	No	38	65
10	Bayern	Germany	Yes	34	90
11	Liverpool	England	No	38	84
12	Arsenal	England	Yes	38	79
13	Total				

The value 0 is shown in cell H8, which is the result of the IF function for the team Lazio (row 8), where the 'Champions league' status is 'No'.

Copying the function for the cells below, we obtain the value of points earned when a team played in the Champions League and 0 when it didn't play

SUM Functions: Sum, Sumif & Sumifs

SUM

The screenshot shows an Excel spreadsheet with the following data:

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79
Total			330	

The formula bar shows the formula: `=+SUM(E4:E12)`

A text box explains: 'Sum' adds all the numbers in a given range of cells

'Sum' adds all the numbers in a given range of cells

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want

Clipboard Font Alignment Number

1 2 3

PMT X ✓ f_x =SUMIF(C4:C12;C18;E4:E12)

Sumif adds the numbers in a given cell range if a condition is satisfied

In the example that we have to the left we see that the function has **3 arguments**

1 "Range" contains the cells that will be evaluated

2 "Criteria" is the condition to be satisfied by the cells in the range

3 "Sum range" is the range with sells to be summed, when the condition is satisfied

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes		
Milan	Italy	Yes		
Manchester United	England	Yes		
Hamburger	Germany	No	34	27
Lazio	Italy	No	20	56
Fiorentina	Italy	No		
Bayern	Germany	Yes		
Liverpool	England	No	38	84
Arsenal	England	Yes		
Total				

Italy

2;C18;E4:E12)

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number Styles

PMT X ✓ fx =SUMIF(C4:C12

In the function to the left we have the following:
1) The first argument is the range C4:C12 – countries of origin

The second argument is C18 – Italy. It is the criterion that will be applied to the range. The function will sum the cells in the Sum range (3rd argument) only when it finds "Italy"

The sum range is from E4 to E12. The Sumif function sums the number of games played only for teams from Italy

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	74
Milan	Italy	Yes		
Manchester United	England	Yes		
Hamburger	Germany	No		
Lazio	Italy	No		
Fiorentina	Italy	No		
Bayern	Germany	Yes		
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79
Total			330	593

Italy

2;C18;E4:E12)

Format Painter | Clipboard | Font | Alignment | Number

PMT | X | ✓ | fx | =SUMIFS(F4:F12;C4:C12;C16;D4:D12;D16)

Team	Country	Champions league
Borussia	Germany	Yes
Milan	Italy	Yes
Manchester United	England	Yes
Hamburger	Germany	No
Lazio	Italy	No
Fiorentina	Italy	No
Bayern	Germany	Yes
Liverpool	England	No
Arsenal	England	Yes
Total		

Sumifs adds the numbers in a given cell range if multiple conditions are satisfied

The function has **n** arguments

1 The first argument is the "Sum range". These are the cells to be summed if the conditions are satisfied

2 "Criteria range 1" contains the first range with cells that will be evaluated

3 "Criteria 1" is the condition to be satisfied by the cells in "Criteria range 1"

4 "Criteria range 2" contains the second range with cells that will be evaluated

5 "Criteria 2" is the condition to be satisfied by the cells in "Criteria range 2"

England Yes

Sumifs					
Team	Country	Champions league	Games played	Points earned	
Borussia	Germany	Yes	34	71	
Milan	Italy	Yes	38	57	
Manchester United	England	Yes	38	64	
Hamburger	Germany	No	34	27	
Lazio	Italy	No	38	56	
Fiorentina	Italy	No	38	65	
Bayern	Germany	Yes	34	90	
Liverpool	England	No	38	84	
Arsenal	England	Yes	38	79	
Total			330	593	

England	Yes	=SUMIFS(F4:F12;C4:C12;C16;D4:D12;D16)
---------	-----	---------------------------------------

In the function to the left we have the following:
1) The first argument is the sum range F4:F12 – points earned

The second argument is “Criteria range 1” C4:C12 – Countries of origin

The third argument is C18 – “Italy”. It is the criterion that will be applied to the first range

The fourth argument is “Criteria range 2” D4:D12 – Champions league participation

The fifth argument is D18 – “Yes”. It is the criterion that will be applied to the second range

COUNT Functions: Count, Counta, Countif, Countifs

Excel functions -

File Home Insert Page Layout Formulas Data Review View Developer Tell me what y

Cut Copy Paste Format Painter Clipboard Font

Arial 9 A⁺ A⁻ B I U A

Wrap Text Merge & Center

General

PMT X ✓ f_x =+COUNT(F4:F12)

	A	B	C	D	E
1		Count			
2					
3		Team	Country	Champions league	Games played
4		Borussia	Germany	Yes	34
5		Milan	Italy	Yes	38
6		Manchester United	England	Yes	38
7		Hamburger	Germany	No	34
8		Lazio	Italy	No	38
9		Fiorentina	Italy	No	38
10		Bayern	Germany	Yes	34
11		Liverpool	England	No	38
12		Arsenal	England	Yes	38
13					
14					
15					
16					
17					
18					

Points earned

71

57

64

27

56

65

90

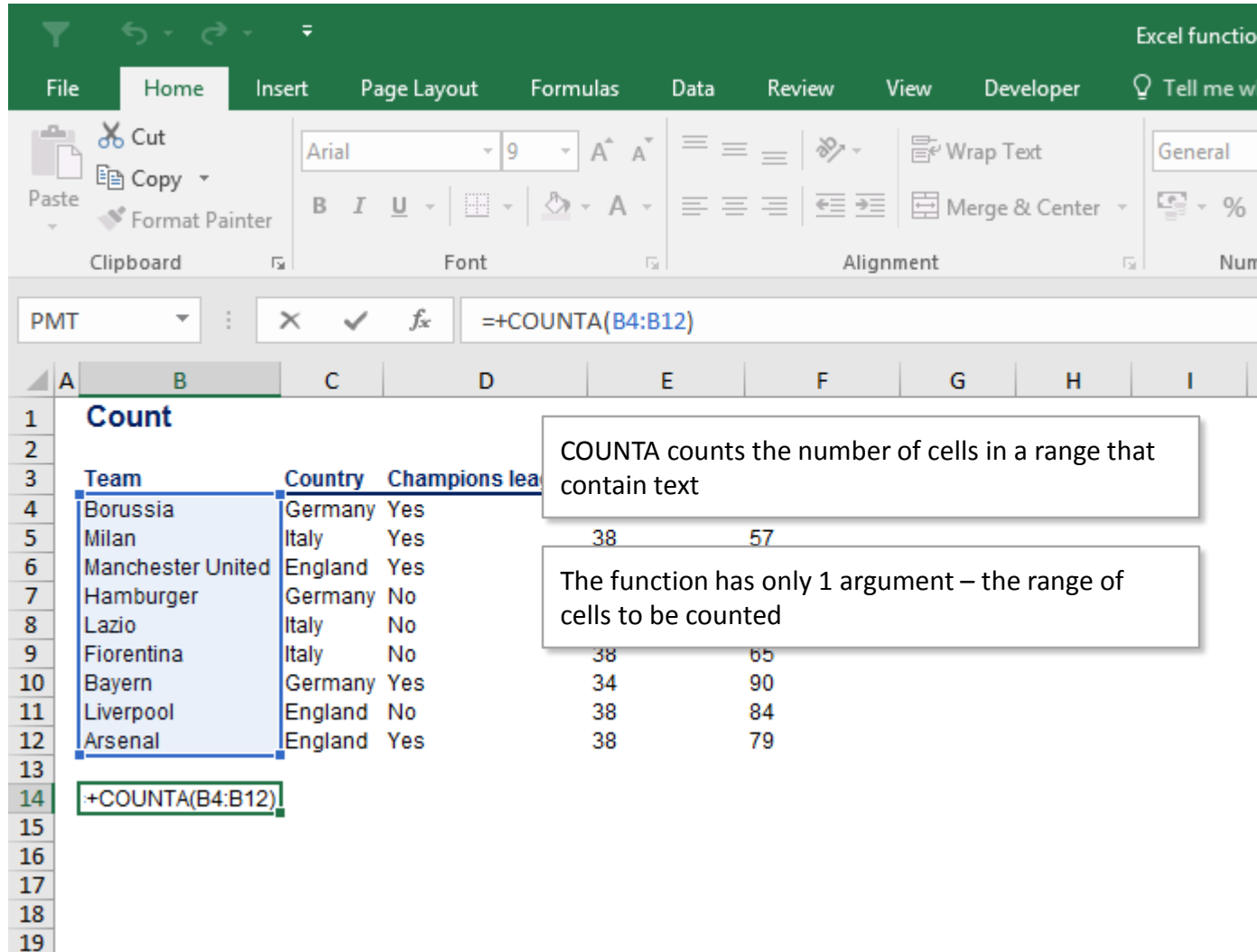
84

79

COUNT(F4:F12)

COUNT counts the number of cells in a range that contain numbers

The function has only 1 argument – the range of cells to be counted

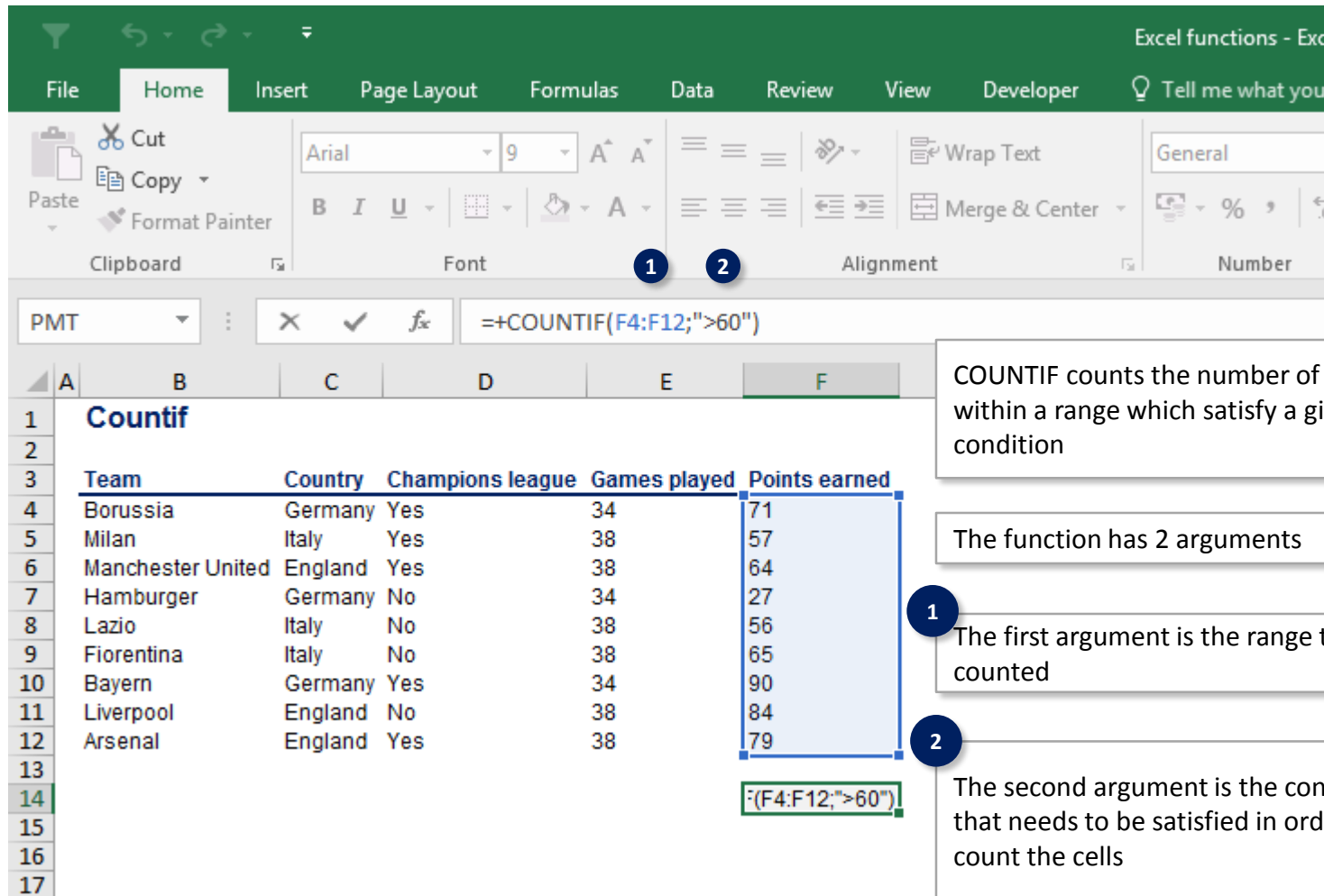


The screenshot shows the Microsoft Excel interface. The ribbon is set to 'Home'. The formula bar shows the formula `=+COUNTA(B4:B12)`. The worksheet has columns A through I and rows 1 through 19. The data is as follows:

	A	B	C	D	E	F	G	H	I
1		Count							
2									
3		Team	Country	Champions league					
4		Borussia	Germany	Yes					
5		Milan	Italy	Yes	38	57			
6		Manchester United	England	Yes					
7		Hamburger	Germany	No					
8		Lazio	Italy	No					
9		Fiorentina	Italy	No	38	65			
10		Bayern	Germany	Yes	34	90			
11		Liverpool	England	No	38	84			
12		Arsenal	England	Yes	38	79			
13									
14		+COUNTA(B4:B12)							
15									
16									
17									
18									
19									

Two callout boxes provide additional information:

- Box 1: COUNTA counts the number of cells in a range that contain text
- Box 2: The function has only 1 argument – the range of cells to be counted



Excel functions - Exc

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you

Cut Copy Paste Format Painter Clipboard

Arial 9 A A Font

1 2

Alignment Merge & Center Wrap Text

Number

PMT X ✓ f_x =+COUNTIF(F4:F12;">60")

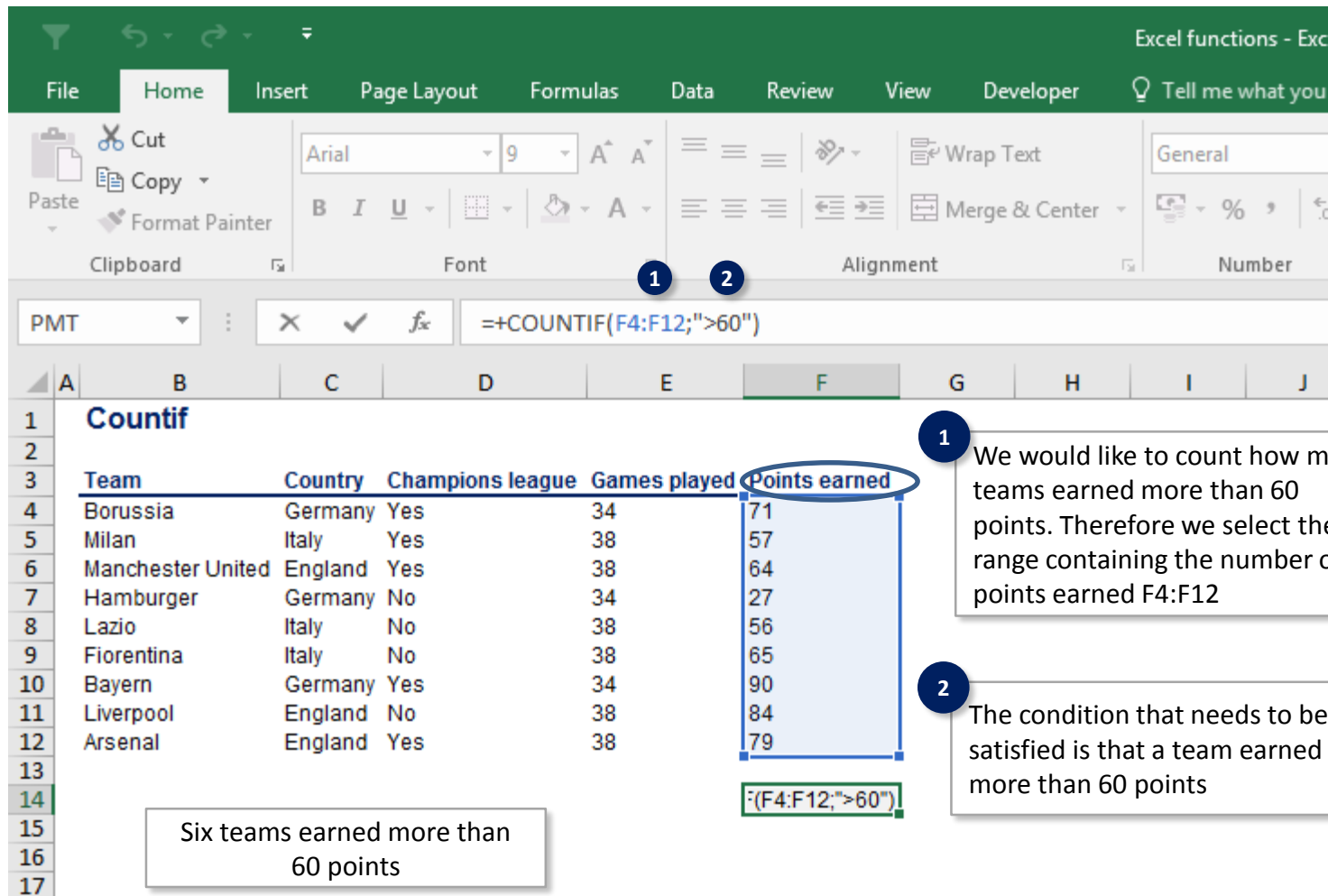
	A	B	C	D	E	F
1		Countif				
2						
3		Team	Country	Champions league	Games played	Points earned
4		Borussia	Germany	Yes	34	71
5		Milan	Italy	Yes	38	57
6		Manchester United	England	Yes	38	64
7		Hamburger	Germany	No	34	27
8		Lazio	Italy	No	38	56
9		Fiorentina	Italy	No	38	65
10		Bayern	Germany	Yes	34	90
11		Liverpool	England	No	38	84
12		Arsenal	England	Yes	38	79
13						
14						=COUNTIF(F4:F12;">60")
15						
16						
17						

COUNTIF counts the number of cells within a range which satisfy a given condition

The function has 2 arguments

1 The first argument is the range to be counted

2 The second argument is the condition that needs to be satisfied in order to count the cells



Excel functions - Exc

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you

Clipboard Font Alignment Number

PMT : X ✓ fx =+COUNTIF(F4:F12;">60")

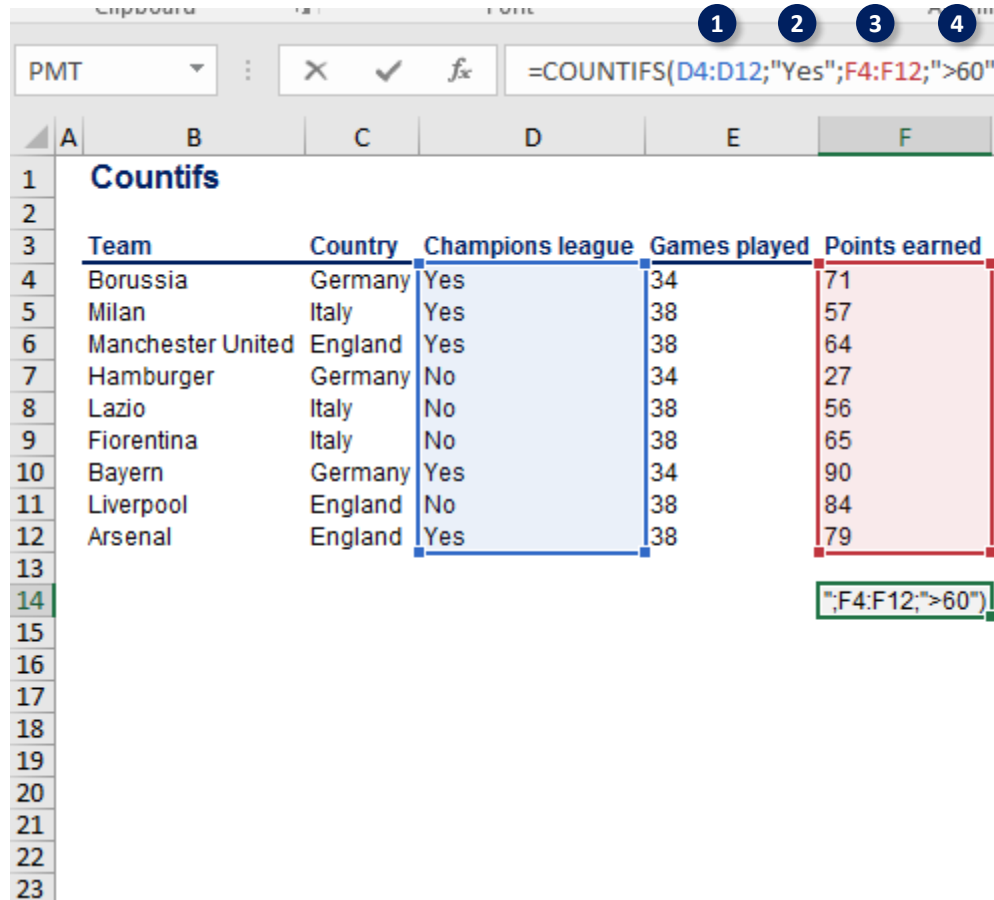
	A	B	C	D	E	F	G	H	I	J
1	Countif									
2										
3		Team	Country	Champions league	Games played	Points earned				
4		Borussia	Germany	Yes	34	71				
5		Milan	Italy	Yes	38	57				
6		Manchester United	England	Yes	38	64				
7		Hamburger	Germany	No	34	27				
8		Lazio	Italy	No	38	56				
9		Fiorentina	Italy	No	38	65				
10		Bayern	Germany	Yes	34	90				
11		Liverpool	England	No	38	84				
12		Arsenal	England	Yes	38	79				
13										
14						=COUNTIF(F4:F12;">60")				
15										
16										
17										

1 We would like to count how many teams earned more than 60 points. Therefore we select the range containing the number of points earned F4:F12

2 The condition that needs to be satisfied is that a team earned more than 60 points

Six teams earned more than 60 points

COUNTIFS



	A	B	C	D	E	F
1		Countifs				
2						
3		Team	Country	Champions league	Games played	Points earned
4		Borussia	Germany	Yes	34	71
5		Milan	Italy	Yes	38	57
6		Manchester United	England	Yes	38	64
7		Hamburger	Germany	No	34	27
8		Lazio	Italy	No	38	56
9		Fiorentina	Italy	No	38	65
10		Bayern	Germany	Yes	34	90
11		Liverpool	England	No	38	84
12		Arsenal	England	Yes	38	79
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						

COUNTIFS counts the number of cells within multiple ranges, which satisfy multiple conditions

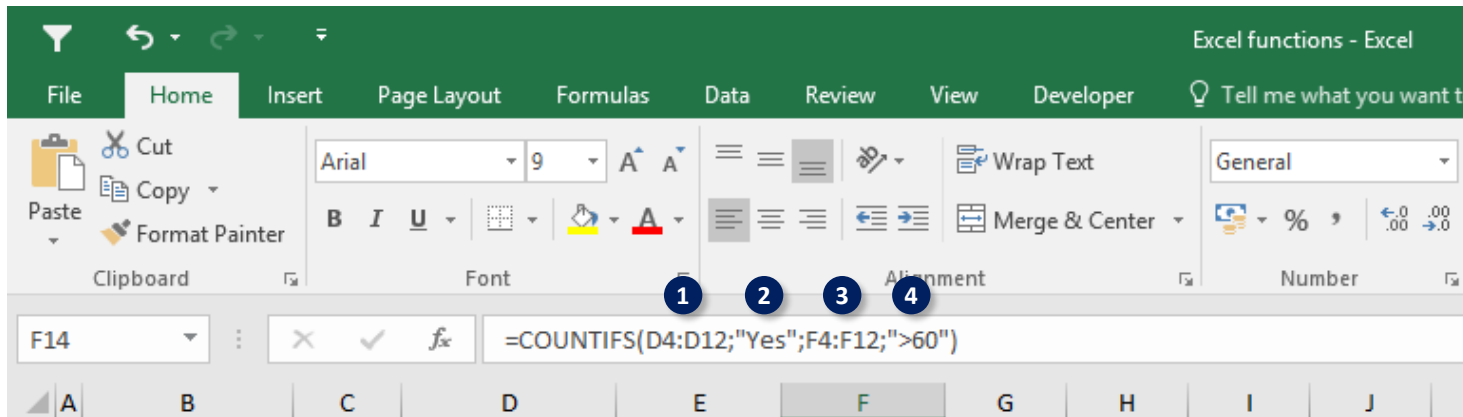
The function has **n** arguments

1 The first argument is the "Criteria range 1". The first range of cells that we would like to be evaluated

2 "Criteria 1" is the condition to be satisfied by the cells in "Criteria range 1"

3 "Criteria range 2" contains the second range with cells that will be evaluated

4 "Criteria 2" is the condition to be satisfied by the cells in "Criteria range 2"



Countifs					
Team	Country	Champions league	Games played	Points	
Borussia	Germany	Yes	34	71	
Milan	Italy	Yes	38	57	
Manchester United	England	Yes	38	64	
Hamburger	Germany	No	34	27	
Lazio	Italy	No	38	56	
Fiorentina	Italy	No	38	65	
Bayern	Germany	Yes	34	90	
Liverpool	England	No	38	84	
Arsenal	England	Yes	38	79	

We would like to count the teams that satisfy two conditions:

- 1) Participated in the Champions league ("Yes")
- 2) Earned more than 60 Points

1 The first argument is the range indicating whether a team played in the Champions league ("Yes" or "No")

2 Then we have the condition that needs to be satisfied: "Yes" as we want to count only the teams which participated in the Champions league

3 The third argument is the range which contains the number of points earned by each team

4 We want to count only teams that earned more than 60 points

Lookup Functions: Vlookup & Hlookup

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Cut Copy Paste Format Painter Clipboard

Arial 9 A A B I U Font

Wrap Text Merge & Center Alignment

General Number Styles

Conditional Formatting Format as Table Cell Styles

I4

Vlookup

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79

Team	Country	Champions league	Games played	Points earned
Lazio				
Borussia				

Use Vlookup in order to fill the table on the right with data from the table on the left

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number Styles

Clipboard: Cut, Copy, Paste, Format Painter

Font: Arial, 9, Bold, Italic, Underline, Text Color, Background Color

Alignment: Wrap Text, Merge & Center

Number: General, Percentage, Decimal places, Rounding

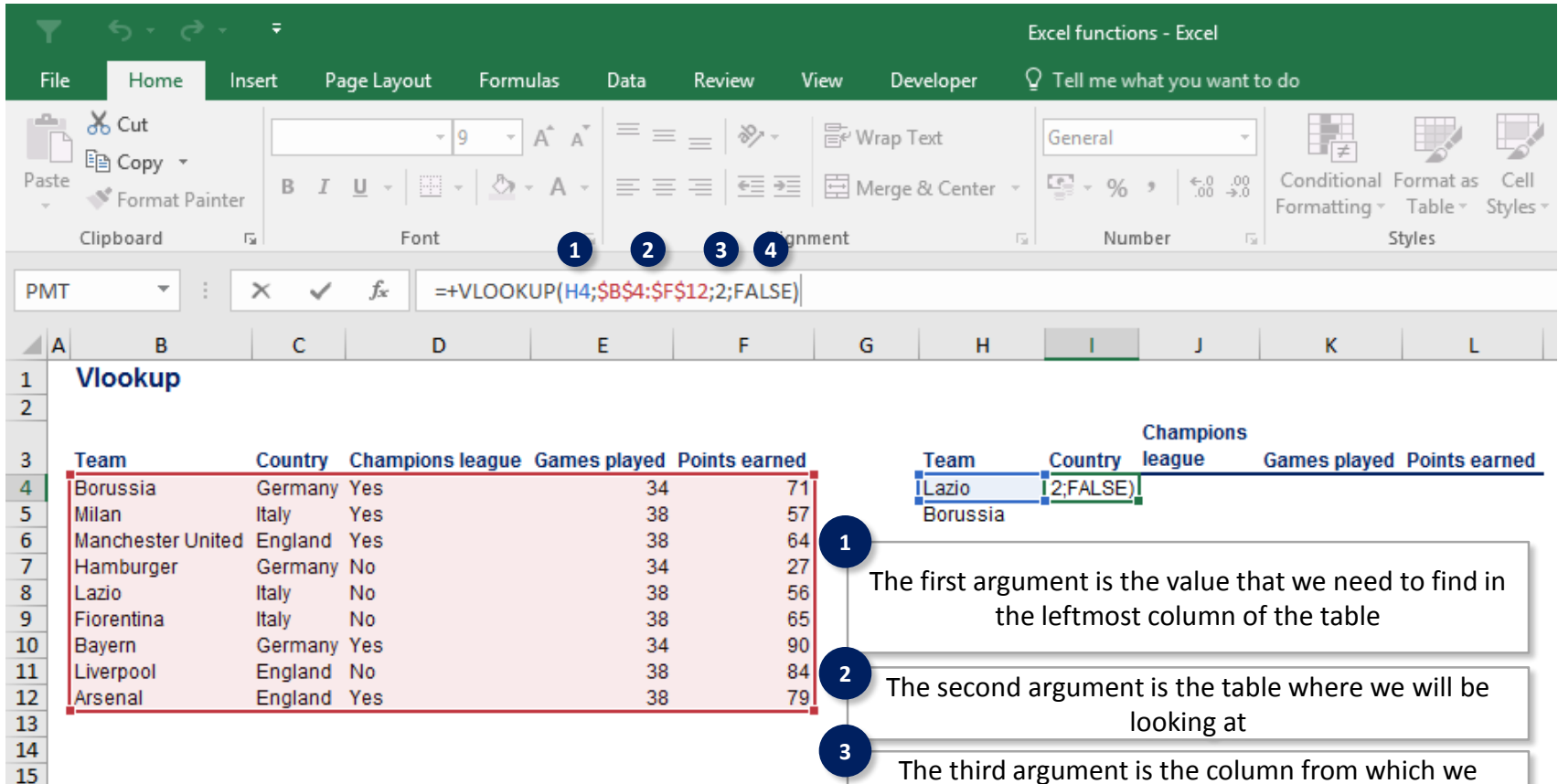
Styles: Conditional Formatting, Format as Table, Cell Styles

Formula Bar: I4, =VLOOKUP(H4;\$B\$4:\$F\$12;2;FALSE)

	A	B	C	D	E	F	G	H	I	J	K	L
1		Vlookup										
2												
3		Team	Country	Champions league	Games played	Points earned						
4		Borussia	Germany	Yes	34	71						
5		Milan	Italy	Yes	38	57						
6		Manchester United	England	Yes	38	64						
7		Hamburger	Germany	No	34	27						
8		Lazio	Italy	No	38	56						
9		Fiorentina	Italy	No	38	65						
10		Bayern	Germany	Yes	34	90						
11		Liverpool	England	No	38	84						
12		Arsenal	England	Yes	38	79						
13												
14												
15												
16												
17												

	Team	Country	Champions league	Games played	Points earned
	Lazio	Italy			
	Borussia				

VLOOKUP looks for a value in the leftmost column of a table, and then returns a value in the same row from a column that you specify



Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number Styles

Formula Bar: `=VLOOKUP(H4,$B$4:$F$12;2;FALSE)`

	Team	Country	Champions league	Games played	Points earned
4	Borussia	Germany	Yes	34	71
5	Milan	Italy	Yes	38	57
6	Manchester United	England	Yes	38	64
7	Hamburger	Germany	No	34	27
8	Lazio	Italy	No	38	56
9	Fiorentina	Italy	No	38	65
10	Bayern	Germany	Yes	34	90
11	Liverpool	England	No	38	84
12	Arsenal	England	Yes	38	79

Formula result: Lazio

1 The first argument is the value that we need to find in the leftmost column of the table

2 The second argument is the table where we will be looking at

3 The third argument is the column from which we would like to make an extraction

4 Fourth argument is a logical value; we indicate whether we want the closest match ("TRUE") or an exact match ("FALSE")

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do Sign in Share

Clipboard Font Alignment Number Styles Cells Editing

Formula Bar: `=VLOOKUP(H4,$B$4:$F$12;2;FALSE)`

Vlookup

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79

Formula Bar: `=VLOOKUP(H4,$B$4:$F$12;2;FALSE)`

Cell H4: `Lazio`

Cell I4: `2;FALSE`

1 Our lookup value is Lazio – H4. We would like to find this value in the leftmost column of the table to the left

2 The second argument is the table with data : B4:F12. The function will look for Lazio in the leftmost column of the table - B4:B12

3 We select 2 as a column number, as we would like to obtain a value from the second column of the table when it finds a match for Lazio

4 The fourth argument is "FALSE" because we need an exact match

VLOOKUP

365 Careers

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do Sign in Share

Clipboard Font Alignment Number Styles Cells Editing

Formula Bar: `=VLOOKUP(H4,$B$4:$F$12;2;FALSE)`

Vlookup

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Florentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79

Lookup value

Team	Country	Champions league	Games played	Points earned
Lazio	Italy	No	38	56
Borussia	Germany	Yes	34	71

The Lookup Value needs to be found within the leftmost column of the table

Index --> If Sum Sumif Sumifs Count Countif Countifs Vlookup Hlookup ...

VLOOKUP

The screenshot shows the Microsoft Excel interface with the following elements:

- Formula Bar:** Contains the formula `=VLOOKUP(H4,B$4:$F$12;2;FALSE)`. A blue circle highlights the value `H4`, and a blue arrow points from it to the 'Lazio' cell in the table below.
- Worksheet:** Contains a table of football teams and their statistics. The table has 5 columns: Team, Country, Champions league, Games played, and Points earned. The 'Lazio' team is highlighted in the 'Team' column.
- Annotations:** Five numbered circles (1-5) are placed above the table headers to indicate the VLOOKUP parameters: 1 for the lookup value (Lazio), 2 for the table array (B4:F12), 3 for the column index (2), 4 for the range (B4:F12), and 5 for the match type (FALSE).

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79

Once the lookup value has been found, we indicate which column we would like to obtain as a result. In this case we have indicated the second column "Country"

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Cut Copy Paste Format Painter Clipboard

Arial 9 A A B I U Font

Wrap Text Merge & Center Alignment

General Number Conditional Formatting Format as Table Cell Styles

I4

Vlookup

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79

Team	Country	Champions league	Games played	Points earned
Lazio				
Borussia				

Use Hlookup in order to fill the table to the right with data from the table to the left

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number Styles Cells

PMT $\times$ $\checkmark$ f_x `=HLOOKUP(H4;$B$3:$F$7;2;FALSE)`

Team	Borussia	Milan	Manchester United	Hamburger
Country	Germany	Italy	England	Germany
Champions league	Yes	Yes	Yes	No
Games played	34	38	38	34
Points earned	71	57	64	27

Team Country Champions league Games played Points earned

Milan 17.2;FALSE

Hamburger

HLOOKUP looks for a value in the top row of a table, and then returns a value in the same column from a row that you specify

... If Sum Sumif Sumifs Count Countif Countifs Vlookup Hlookup Index Iv ...

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

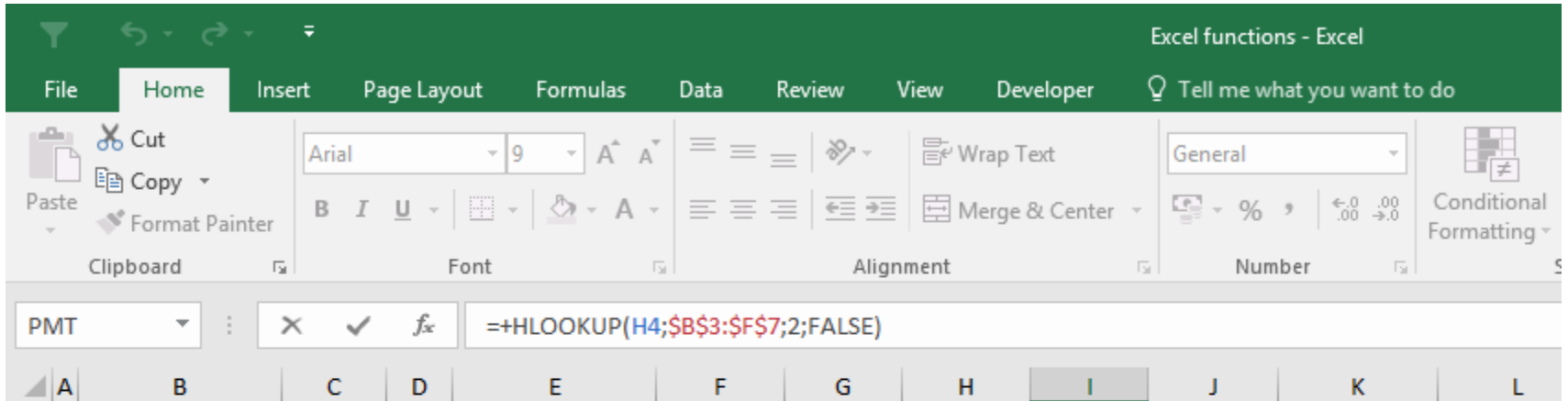
Clipboard Font Alignment Number Styles

PMT X ✓ fx =hlookup(

HLOOKUP(lookup_value; table_array; row_index_num; [range_lookup])

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27

- 1 The first argument is the value that we need to find in the top row of the table
- 2 The second argument is the table where we will be looking at
- 3 The third argument is the row from which we would like to make an extraction
- 4 Fourth argument is a logical value; we indicate whether we want the closest match ("TRUE") or an exact match ("FALSE")



Hlookup

Team	Borussia	Milan	Manchester United	Hamburger
Country	Germany	Italy	England	Germany
Champions league	Yes	Yes	Yes	No
Games played	34	38	38	34
Points earned	71	57	64	27

Team	Country	Champions league	Games played	Points earned
Milan	Lazio			
Hamburger				

1 Our lookup value is Lazio – H4. We would like to find this value in the top row of the table to the left

3 We select 2 as a row number as we would like to obtain a value from the second row of the table when it finds a match for Lazio

2 The second argument is the table with data : B3:F7. The function will look for Lazio in the top row of the table – B3:B7

4 The fourth argument is "FALSE" because we need an exact match

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number Styles

PMT : X ✓ fx =HLOOKUP(H4;\$B\$3:\$F\$7;2;FALSE)

Team	Borussia	Milan	Manchester United	Hamburger
Country	Germany	Italy	England	Germany
Champions league	Yes	Yes	Yes	No
Games played	34	38	38	34
Points earned	71	57	64	27

Team Country Champions league Games played Points earned

Milan 17;2;FALSE)

Hamburger

The Lookup Value needs to be found in the top row of the table

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number Styles

PMT $\times$ $\checkmark$ f_x `=HLOOKUP(H4:B$3:$F$7;2;FALSE)`

Hlookup

Team	Borussia	Milan	Manchester United	Hamburger
Country	German	Italy	England	Germany
Champions league	Yes	Yes	Yes	No
Games played	34	38	38	34
Points earned	71	57	64	27

- 1
- 2
- 3
- 4
- 5

Once the lookup value has been found, we indicate which row we would like to obtain as a result. In this case we have indicated the second row ("Country")

Team	Country	Champions league	Games played	Points earned
Milan	<code>I7;2;FALSE)</code>			
Hamburger				

Index & Match

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment

Index is a function which returns a value from the intersection of a row and column

The function has 3 arguments

Index

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79

1 The first argument is the array in which we would like to make an extraction

2 The second argument is the row number within the array

3 The third argument is the column number within the array

`=INDEX(B4:C12;5;2)`

`EX(B4:C12;5;2)`

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number Styles

PMT $\times$ $\checkmark$ f_x `=INDEX(B4:C12;5;2)`

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Index												
2														
3		Team	Country	Champions league	Games played	Points earned								
4	1	Borussia	Germany	Yes	34	71								
5	2	Milan	Italy	Yes	38	57								
6	3	Manchester United	England	Yes	38	64								
7	4	Hamburger	Germany	No	34	27								
8	5	Lazio	Italy	No	38	56								
9		Fiorentina	Italy	No	38	65								
10		Bayern	Germany	Yes	34	90								
11		Liverpool	England	No	38	84								
12		Arsenal	England	Yes	38	79								
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														

Index finds the intersection between the 5th row and the 2nd column within the array B4:C12 and delivers its result

`EX(B4:C12;5;2)`

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment

Match returns the relative position of an item within an array

Match has 3 arguments

1 "Lookup value" is the value that you want to find in order to obtain the number that you are looking for

2 "Lookup array" is the array in which we will look for the "lookup value"

3 The third argument is a logical value: "0" for an exact match and "1" for closest match

PMT X ✓ fx =INDEX(B4:C12;5;2)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Index												
2														
3		Team	Country	Champions league	Games played	Points earned								
4		Borussia	Germany	Yes	34	71								
5		Milan	Italy	Yes	38	57								
6		Manchester United	England	Yes	38	64								
7		Hamburger	Germany	No	34	27								
8		Lazio	Italy	No	38	56								
9		Fiorentina	Italy	No	38	65								
10		Bayern	Germany	Yes	34	90								
11		Liverpool	England	No	38	84								
12		Arsenal	England	Yes	38	79								
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														

EX(B4:C12;5;2)

INDEX & MATCH

365 Careers

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number Styles Cells

J4 $=\text{INDEX}(\text{C4:C12};\text{MATCH}(\$I4;\$B\$4:\$B\$12;0))$

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79

Team Country Champions league Games played Points earned

Milan Italy

Hamburger

Use Index & Match in order to fill the table to the right with data from the table to the left

Index & Match is an **effective substitute of Vlookup**

INDEX & MATCH

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number Styles Cells

J4 =INDEX(C4:C12;MATCH(\$I4;\$B\$4:\$B\$12;0))

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	60

Team Country Champions league Games played Points earned

Milan Italy

Hamburger

Index & Match

Match will deliver as an output the position of the lookup value Milan in the array B4:12. In this example it is 2. Then Index will supply the 2nd value within the range C4:C12 - Italy

Index needs a row number
(column number is optional)

Match is nested in the Index function in order to provide the row number

Average & Averageif

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number Conditional Formatting

PMT

	A	B	C	D	E	F	G	H	I	J	K	
1		Average and Averageif										
2												
3		Team	Country	Champions league	Games played	Points earned						
4		Borussia	Germany	Yes	34	71						
5		Milan	Italy	Yes	38	57						
6		Manchester United	England	Yes	38	64						
7		Hamburger	Germany	No	34	n.a.						
8		Lazio	Italy	No	38	56						
9		Fiorentina	Italy	No	38	65						
10		Bayern	Germany	Yes	34	90						
11		Liverpool	England	No	38	84						
12		Arsenal	England	Yes	38	79						
13												
14												
15						=AVERAGEIF(D4:D12;"Yes";F4:F12)						
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												

"Average" returns the arithmetic mean (the average) of a range of numbers

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Paste Cut Copy Format Painter Clipboard

Arial 9 A⁺ A⁻ B I U Font

Wrap Text Alignment Merge & Center

General Number % , .00 →.0

Conditional Formatting

PMT : X ✓ Σ =AVERAGEIF(D4:D12;"Yes";F4:F12)

Average and Averageif

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	n.a.
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79

Averageif calculates the average of the cells within a given range if they satisfy a condition

- "Range" contains the cells that will be evaluated
- "Criteria" is the condition to be satisfied by the cells in the range
- "Average range" is the range with sells to be averaged when the condition is satisfied

2;"Yes";F4:F12)

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Paste Cut Copy Format Painter Clipboard

Arial 9 A⁺ A⁻ B I U Merge & Center

General

PMT X ✓ Σ =AVERAGEIF(D4:D12;"Yes";F4:F12)

	A	B	C	D	E	F
1		Average and Averageif				
2						
3		Team	Country	Champions league	Games played	Points earned
4		Borussia	Germany	Yes	34	71
5		Milan	Italy	Yes	38	57
6		Manchester United	England	Yes	38	64
7		Hamburger	Germany	No	34	n.a.
8		Lazio	Italy	No	38	56
9		Fiorentina	Italy	No	38	65
10		Bayern	Germany	Yes	34	90
11		Liverpool	England	No	38	84
12		Arsenal	England	Yes	38	79
13						
14						
15						
16						
17						
18						

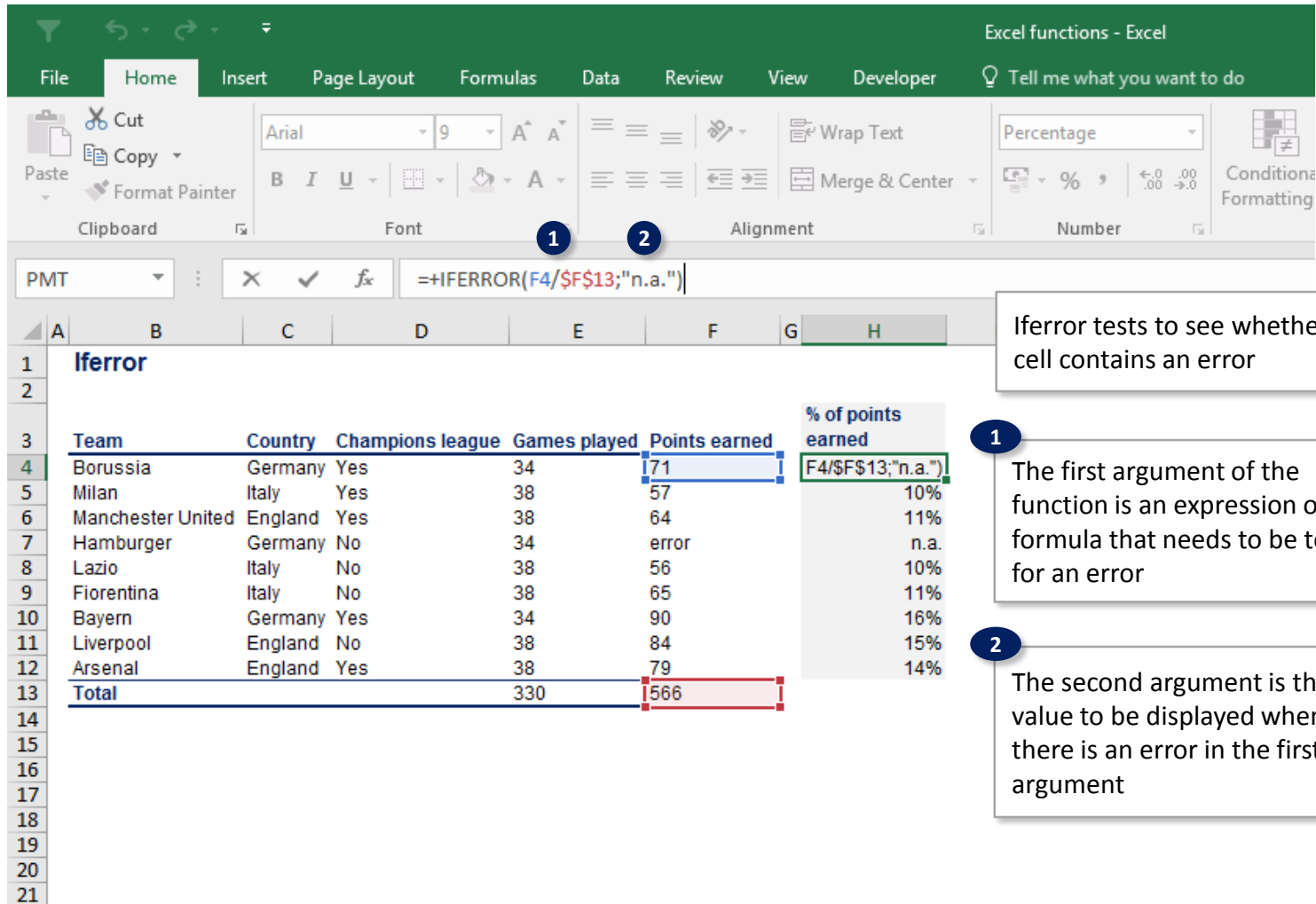
2;"Yes";F4:F12)

In the function to the left we have the following:
1) The first argument is the range D4:D12 – participation in Champions league ("Yes" or "No")

The second argument is "Yes". It is the criterion that will be applied to the range. The function will provide the average of the cells which satisfy the "Yes" condition

The "average range" is from F4 to F12. The Averageif function averages the number of points earned only for teams participating in the Champions league

Iferror



Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number Conditional Formatting

Formula bar: `=IFERROR(F4/$F$13;"n.a.")`

	A	B	C	D	E	F	G	H
1	lfferror							
2								
3		Team	Country	Champions league	Games played	Points earned		% of points earned
4		Borussia	Germany	Yes	34	71		<code>F4/\$F\$13;"n.a.")</code>
5		Milan	Italy	Yes	38	57		10%
6		Manchester United	England	Yes	38	64		11%
7		Hamburger	Germany	No	34	error		n.a.
8		Lazio	Italy	No	38	56		10%
9		Fiorentina	Italy	No	38	65		11%
10		Bayern	Germany	Yes	34	90		16%
11		Liverpool	England	No	38	84		15%
12		Arsenal	England	Yes	38	79		14%
13		Total			330	566		
14								
15								
16								
17								
18								
19								
20								
21								

1 Iferror tests to see whether a cell contains an error

1 The first argument of the function is an expression or formula that needs to be tested for an error

2 The second argument is the value to be displayed when there is an error in the first argument

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number Styles

H4 $\times$ $\checkmark$ f_x `=IFERROR(F4/$F$13;"n.a.")`

	A	B	C	D	E	F	G	H	I	J	K	L
1		lferror										
2												
3		Team	Country	Champions league	Games played	Points earned		% of points earned				
4		Borussia	Germany	Yes	34	71		13%				
5		Milan	Italy	Yes	38	57		10%				
6		Manchester United	England	Yes	38	64		11%				
7		Hamburger	Germany	No	34	error		n.a.				
8		Lazio	Italy	No	38	56		10%				
9		Fiorentina	Italy	No	38	65		11%				
10		Bayern	Germany	Yes	34	90		16%				
11		Liverpool	England	No	38	84		15%				
12		Arsenal	England	Yes	38	79		14%				
13		Total			330	566						
14												
15												
16												
17												
18												
19												
20												

Iferror tests whether there is an error in the expression that we have as a first argument (F4 divided by F13). There isn't an error, therefore it delivers the expression's result

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard Font Alignment Number

H7

	A	B	C	D	E	F	G	H	I	J	K	
1		lferror										
2												
3		Team	Country	Champions league	Games played	Points earned		% of points earned				
4		Borussia	Germany	Yes	34	71		13%				
5		Milan	Italy	Yes	38	57		10%				
6		Manchester United	England	Yes	38	64		11%				
7		Hamburger	Germany	No	34	error		n.a.				
8		Lazio	Italy	No	38	56		10%				
9		Fiorentina	Italy	No	38	65		11%				
10		Bayern	Germany	Yes	34	90		16%				
11		Liverpool	England	No	38	84		15%				
12		Arsenal	England	Yes	38	79		14%				
13		Total			330	566						
14												
15												
16												
17												
18												

Copying the function downwards we can see that when it finds an error it displays "n.a", as we wanted it to

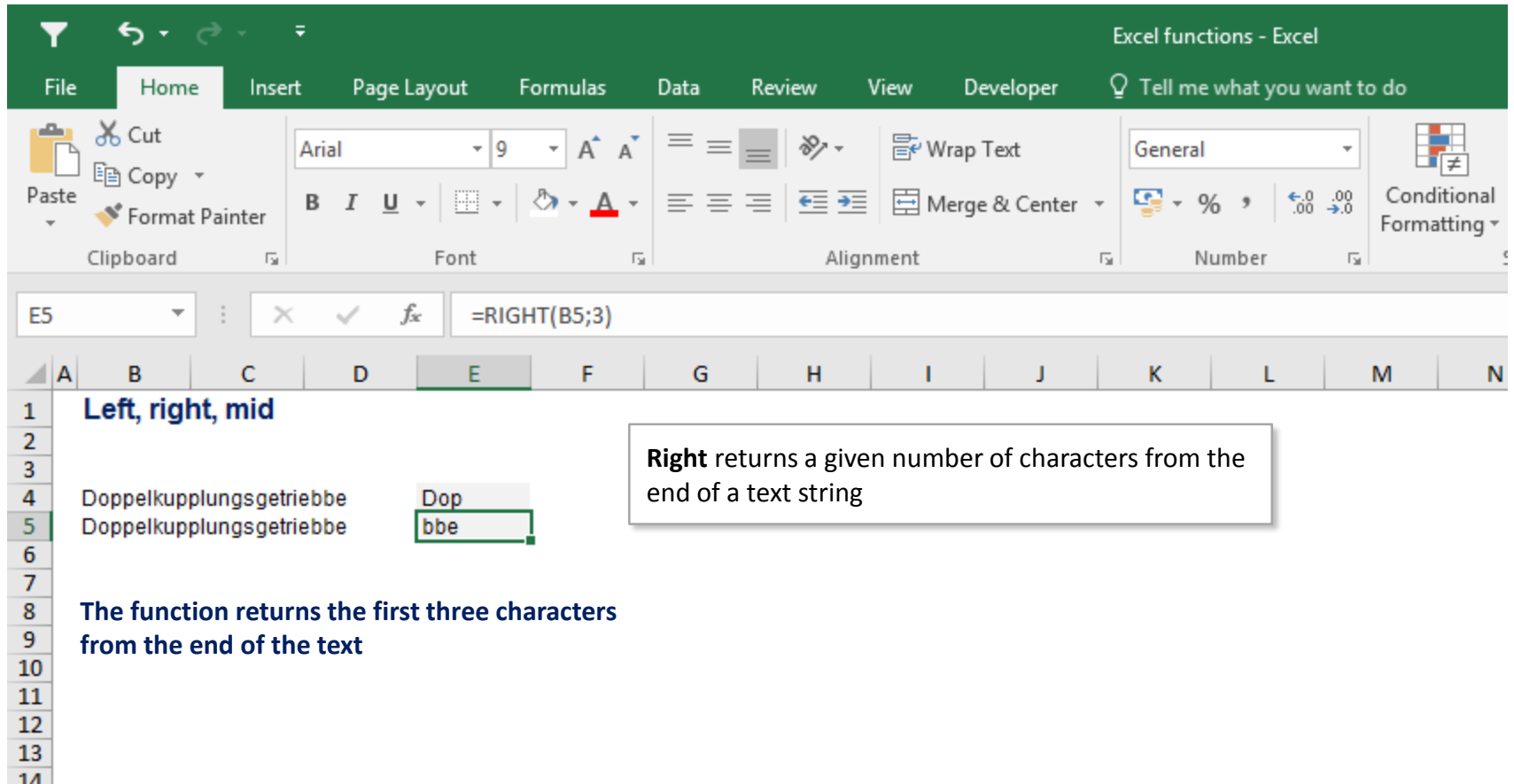
Text functions

The screenshot shows the Microsoft Excel interface. The ribbon is set to 'Home'. The formula bar shows the formula `=LEFT(B4;3)` in cell E4. The result 'Dop' is displayed in cell E4. A tooltip box explains the function: 'Left returns a given number of characters from the beginning of a text string'. The spreadsheet shows the text 'Doppelkupplungsgetriebe' in cell B4. The columns are labeled A through F, and the rows are numbered 1 through 15.

Left, right, mid

The function returns the first three characters from the beginning of the text

Left returns a given number of characters from the beginning of a text string



Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard: Cut, Copy, Paste, Format Painter

Font: Arial, 9, Bold, Italic, Underline, Text Color, Background Color

Alignment: Left, Center, Right, Justify, Indent, Decrease Indent, Increase Indent, Wrap Text, Merge & Center

Number: General, Percentage, Currency, Accounting, Date, Time, Text, Fraction, Scientific, More Number Formats

Conditional Formatting

Formula Bar: E5, $\times$, $\checkmark$, f_x , =RIGHT(B5;3)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														

Left, right, mid

Doppelkupplungsgetriebe

Doppelkupplungsgetriebe

Dop

bbe

Right returns a given number of characters from the end of a text string

The function returns the first three characters from the end of the text

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Cut Copy Paste Format Painter Clipboard

Arial 9 A A B I U Font

Wrap Text Merge & Center General % .00 .00

Condition formatting

E6 X ✓ f_x =MID(B6;4;7)

A B C D E F G

1 **Left, right, mid**

2

3

4 Doppelkupplungsgetriebe Dop

5 Doppelkupplungsgetriebe bbe

6 Doppelkupplungsgetriebe pelkupp

7

8

9 **The function returns seven characters starting from the fourth character of the text**

10

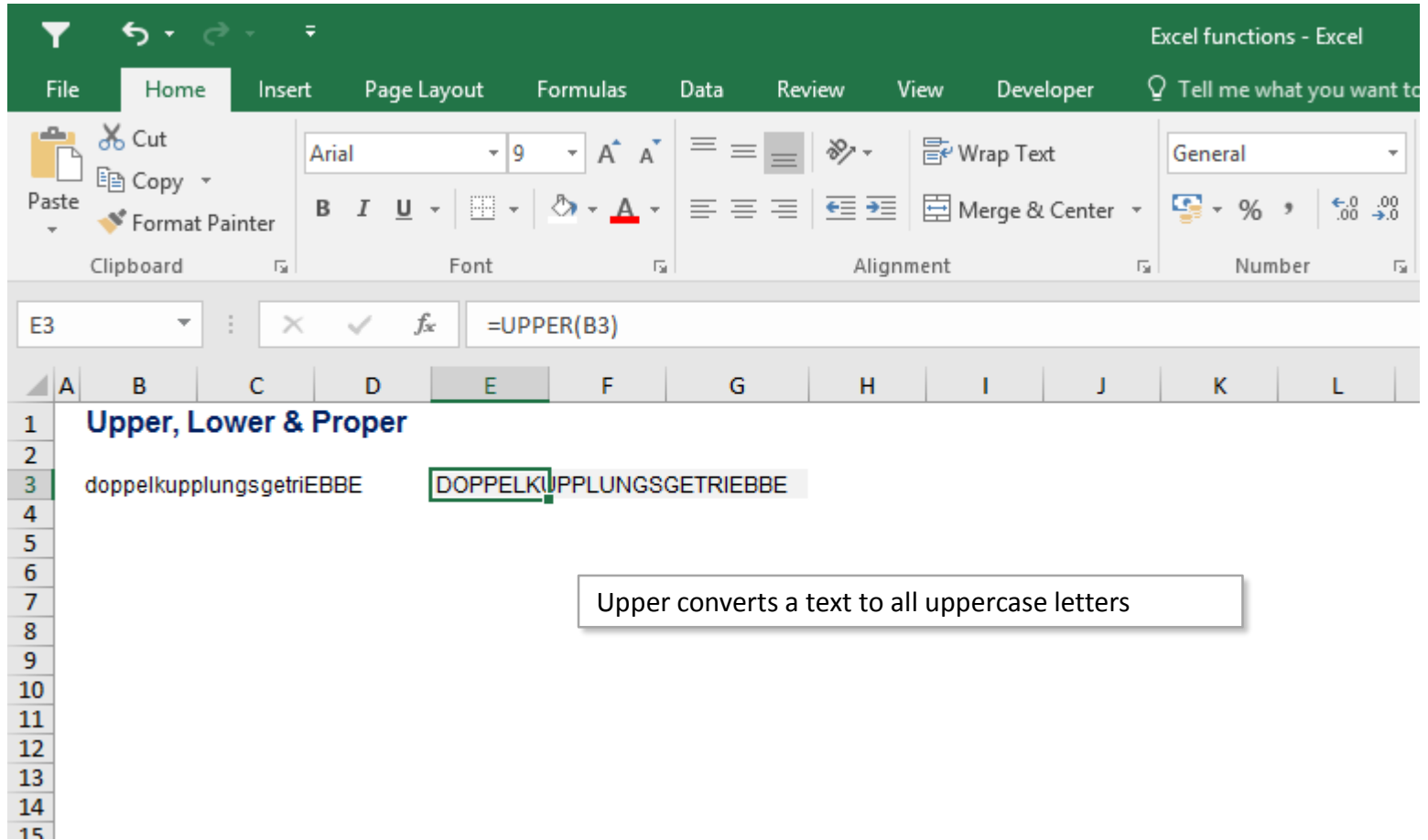
11

12

13

Mid returns a given number of characters from the middle of a text string

The function has 3 arguments: text, starting number and number of characters



The screenshot shows the Microsoft Excel interface. The ribbon is set to 'Home'. The 'Clipboard' group contains 'Cut', 'Copy', 'Paste', and 'Format Painter'. The 'Font' group shows 'Arial' font, size '9', and various formatting options like bold, italic, underline, and text color. The 'Alignment' group includes options for text alignment and orientation. The 'Number' group shows the 'General' format. The formula bar shows the active cell 'E3' with the formula '=UPPER(B3)'. The worksheet grid shows column headers A through L and row numbers 1 through 15. Cell B3 contains the text 'doppelkupplungsgetrieBBE'. Cell E3, which is highlighted, contains the result of the formula, 'DOPPELKUPPLUNGSGETRIEBBE', which is enclosed in a green selection box. A text box with a shadow is positioned below the grid, containing the text 'Upper converts a text to all uppercase letters'.

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard: Cut, Copy, Paste, Format Painter

Font: Arial, 9, Bold, Italic, Underline, Text Color, Background Color

Alignment: Wrap Text, Merge & Center, Text Alignment, Orientation

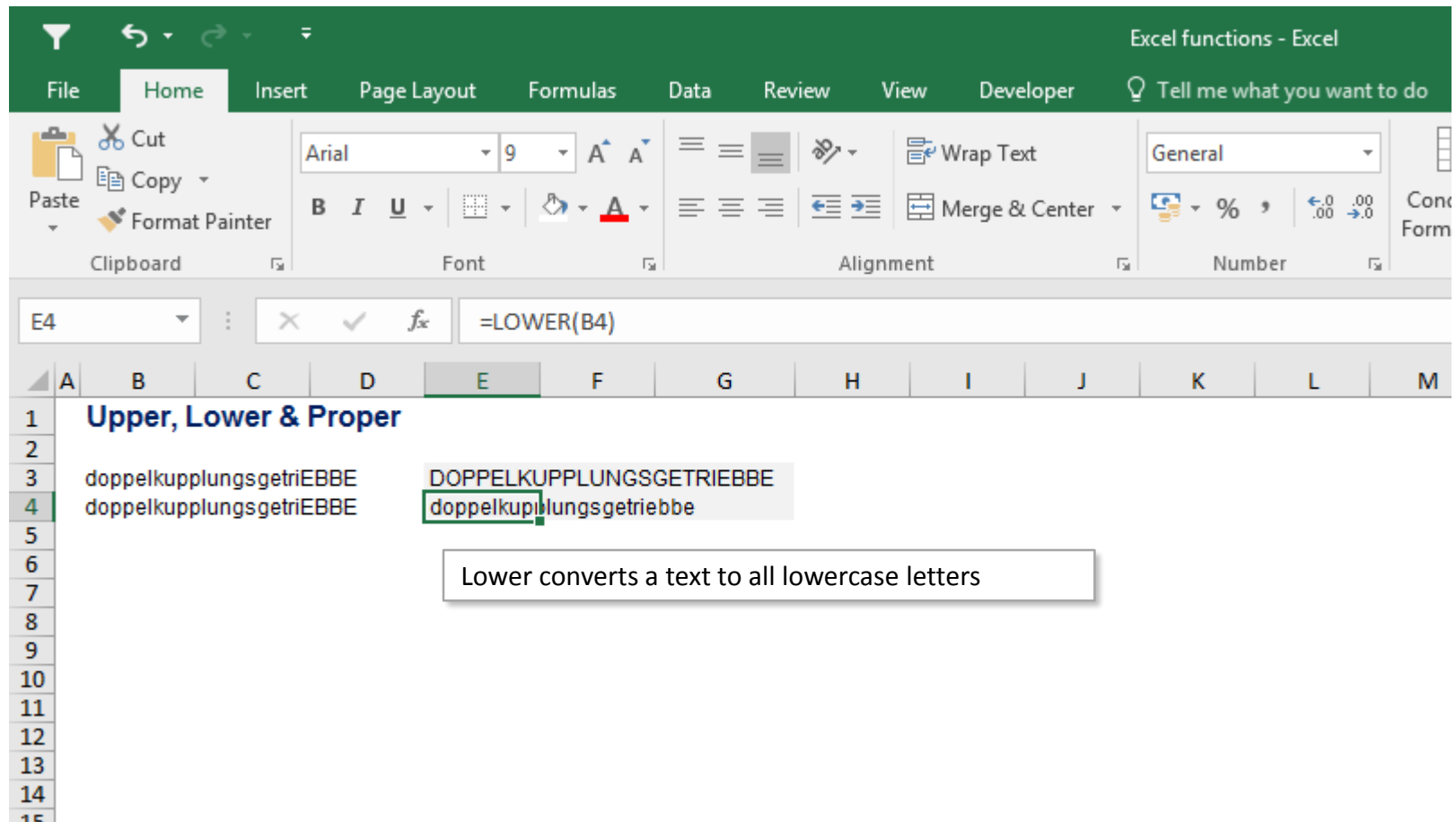
Number: General, Percentage, Decimal Places, Rounding

Formula Bar: E3, =UPPER(B3)

Worksheet Grid:

	A	B	C	D	E	F	G	H	I	J	K	L	
1	Upper, Lower & Proper												
2													
3		doppelkupplungsgetrieBBE			DOPPELKUPPLUNGSGETRIEBBE								
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													

Upper converts a text to all uppercase letters



The screenshot shows the Microsoft Excel interface with the 'Home' ribbon selected. The formula bar displays the formula `=LOWER(B4)`. In the worksheet, cell B4 contains the text 'doppelkupplungsgetrieBBE'. Cell E4, which is the active cell, contains the result 'doppelkupplungsgetriebbe'. A text box with a border and shadow is positioned over the result, stating: 'Lower converts a text to all lowercase letters'.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want

Clipboard: Cut, Copy, Paste, Format Painter

Font: Arial, 9, Bold, Italic, Underline, Color, Background Color

Alignment: Wrap Text, Merge & Center

Number: General, Percentage, Decimals

Proper converts a text to proper case. The first letter of each word is an uppercase letter and the rest of the letters are lowercase

	A	B	C	D
1		Upper, Lower & Proper		
2				
3		doppelkupplungsgetrieBBE		DOPPELKUPPLUNGSGETRIEBBE
4		doppelkupplungsgetrieBBE		doppelkupplungsgetriebbe
5		doppelkupplungsgetrieBBE		Doppelkupplungsgetriebbe
6				
7				
8				
9				
10				
11				
12				
13				

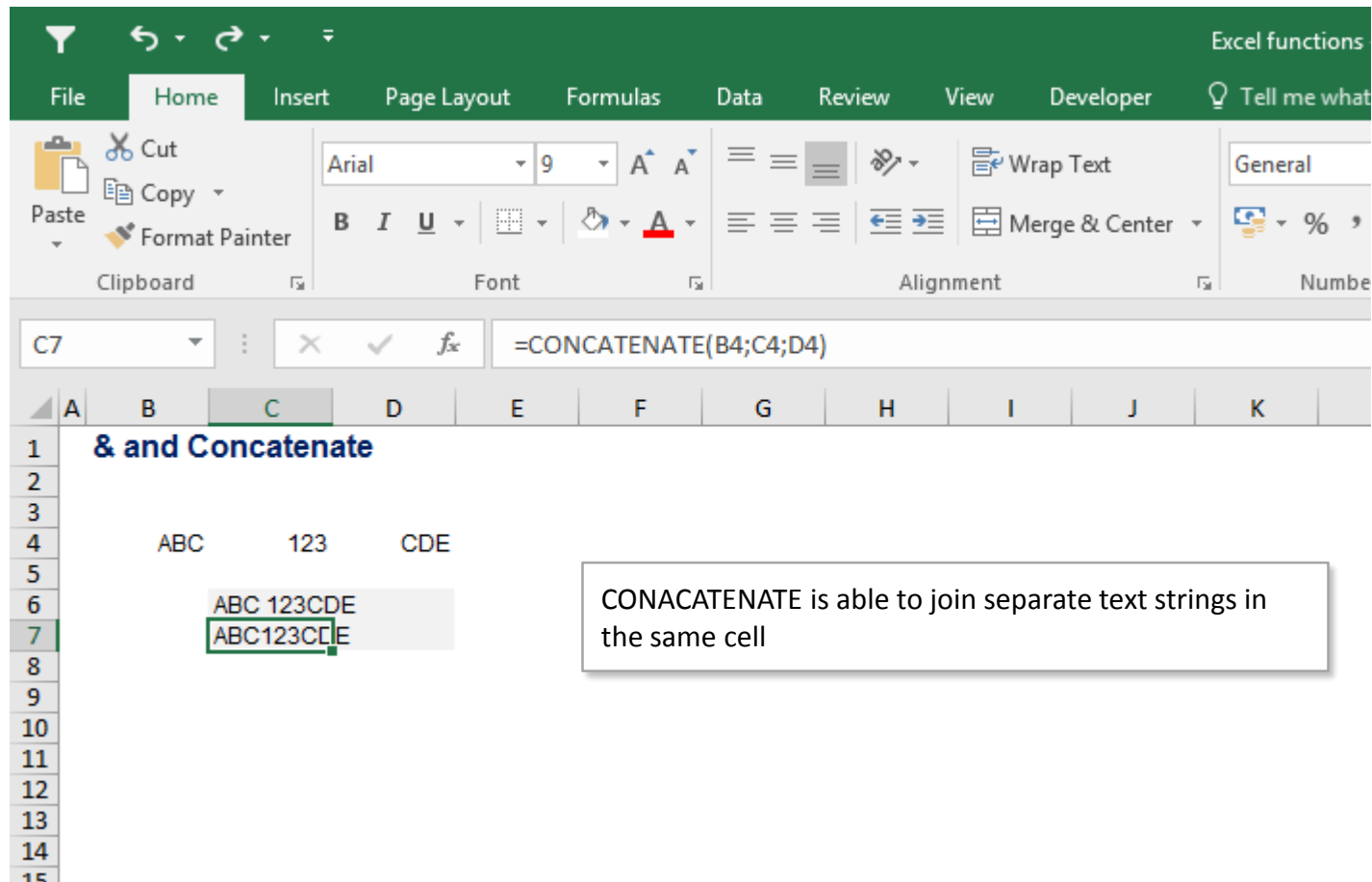
& and CONCATENATE

The screenshot displays the Microsoft Excel interface. The ribbon at the top includes File, Home, Insert, Page Layout, Formulas, Data, Review, View, and Developer. The Home ribbon is active, showing options for Clipboard, Font, Alignment, and Number. The formula bar shows the active cell C6 with the formula `=B4&" "&C4&D4`. The spreadsheet grid shows columns A through L and rows 1 through 18. In row 4, cells B4, C4, and D4 contain the text "ABC", "123", and "CDE" respectively. In row 6, cell C6 is highlighted and contains the result of the formula: "ABC 123CDE". A text box next to the formula bar explains that the ampersand (&) is used to join separate text strings in the same cell.

	A	B	C	D	E	F	G	H	I	J	K	L
1												
2												
3												
4		ABC	123	CDE								
5												
6			ABC 123CDE									
7			ABC123CDE									
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												

& is able to join separate text strings in the same cell

& and CONCATENATE



The screenshot displays the Microsoft Excel interface. The ribbon is set to 'Home', and the 'Formulas' tab is active. The formula bar shows the formula `=CONCATENATE(B4;C4;D4)` entered in cell C7. The worksheet grid shows the following data:

	A	B	C	D	E	F	G	H	I	J	K
1											
2											
3											
4		ABC	123	CDE							
5											
6			ABC 123CDE								
7			ABC123CDE								
8											
9											
10											
11											
12											
13											
14											
15											

A callout box on the right side of the worksheet states: "CONACATENATE is able to join separate text strings in the same cell".

Choose

Excel functions - Excel

File Home Insert Page Layout Formulas Data Review

Cut Copy Paste Format Painter Clipboard Font

Choose is a very useful function for financial modeling purposes. It allows users to build scenarios for a given model

Choose is composed of 3 or more arguments

An index number which determines the value that will be selected

Value 1 is the value which will be selected when the index number is set at 1

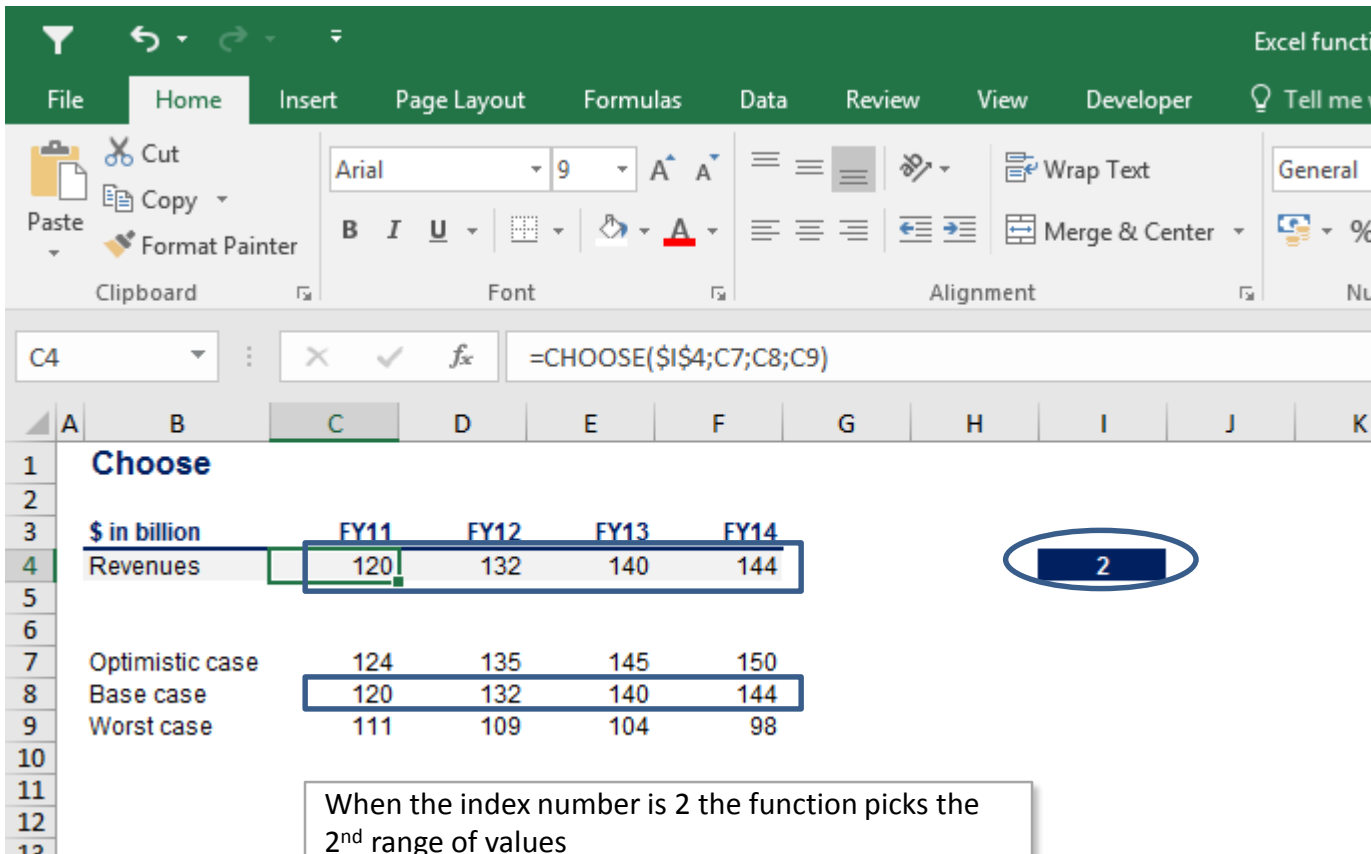
Value 2 is the value which will be selected when the index number is set at 2

Value n is the value which will be selected when the index number is set at n

Choose

\$ in billion	FY11	FY12	FY13	FY14
Revenues	C7:C8:C9	135	145	150
Optimistic case	124	135	145	150
Base case	120	132	140	144
Worst case	111	109	104	98

Formula bar: `=CHOOSE($I$4;C7;C8;C9)`



Excel function: `=CHOOSE($I$4;C7;C8;C9)`

		FY11	FY12	FY13	FY14
Revenues		120	132	140	144
Optimistic case		124	135	145	150
Base case		120	132	140	144
Worst case		111	109	104	98

When the index number is 2 the function picks the 2nd range of values

Max & Min

The screenshot shows the Microsoft Excel interface. The ribbon is set to 'Home', and the 'Formulas' tab is active. The formula bar shows the formula `=MAX(F4:F12)` entered in cell F15. The worksheet contains a table with the following data:

	Team	Country	Champions	Games played	Points earned
4	Borussia	Germany	Yes	34	71
5	Milan	Italy	Yes	38	57
6	Manchester United	England	Yes	38	64
7	Hamburger	Germany	No	34	27
8	Lazio	Italy	No	38	56
9	Fiorentina	Italy	No	38	65
10	Bayern	Germany	Yes	34	90
11	Liverpool	England	No	38	84
12	Arsenal	England	Yes	38	79

Cell F15 contains the result of the Max function, which is 90. A blue arrow points from the text box on the right to cell F15.

Max finds the largest value in a set of values

By using Max we were able to find out that the highest number of points earned is 90

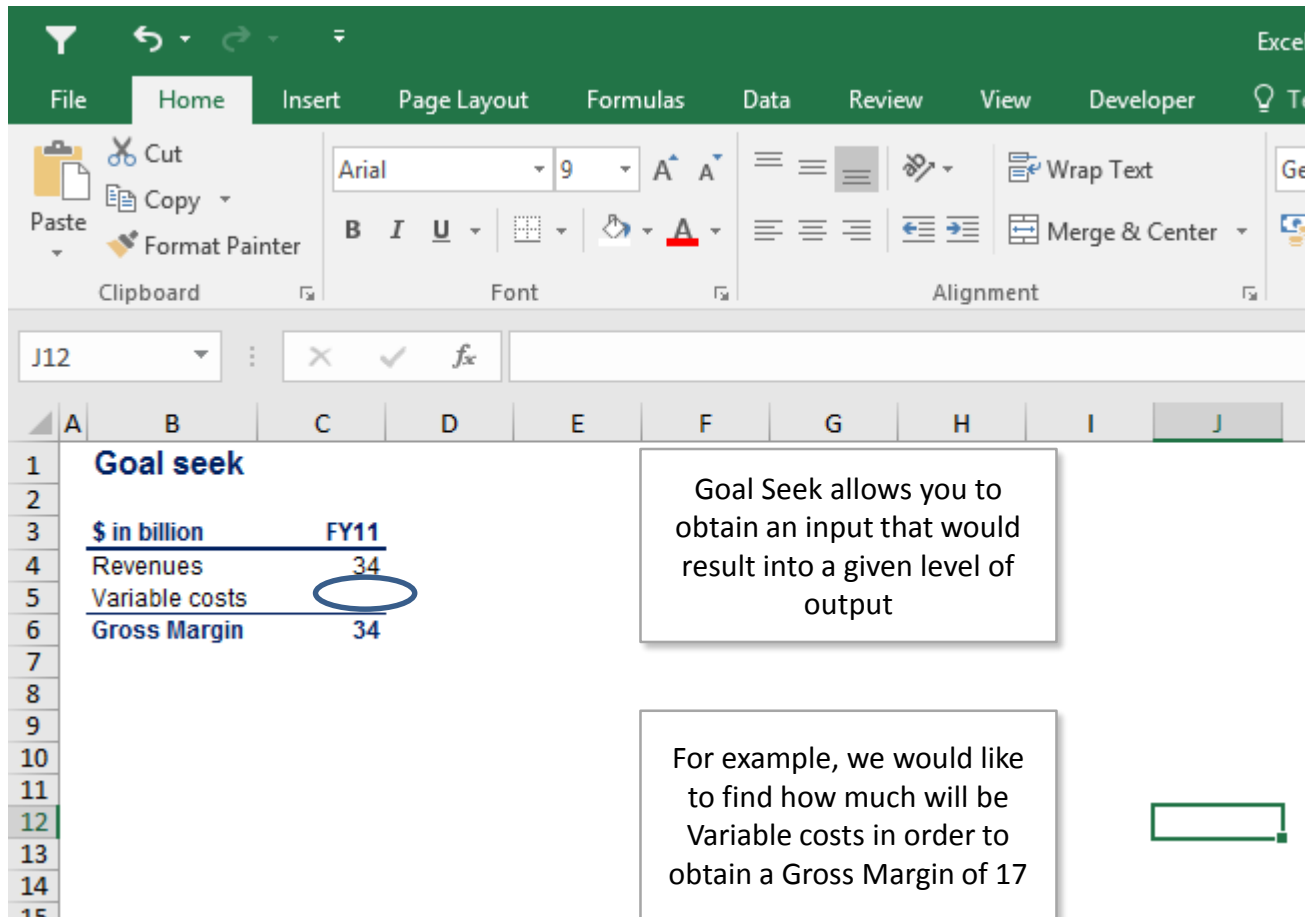
The screenshot shows the Microsoft Excel interface. The ribbon is set to 'Home'. The formula bar shows the formula `=MIN(F4:F12)` entered in cell F16. The worksheet contains a table of football teams and their points earned. The formula has been applied to cell F16, which now displays the value 27, representing the minimum points earned by any team in the list.

Team	Country	Champions	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79

Min finds the smallest value in a set of values

By using Min we were able to find out that the lowest number of points earned is 27

Goal seek

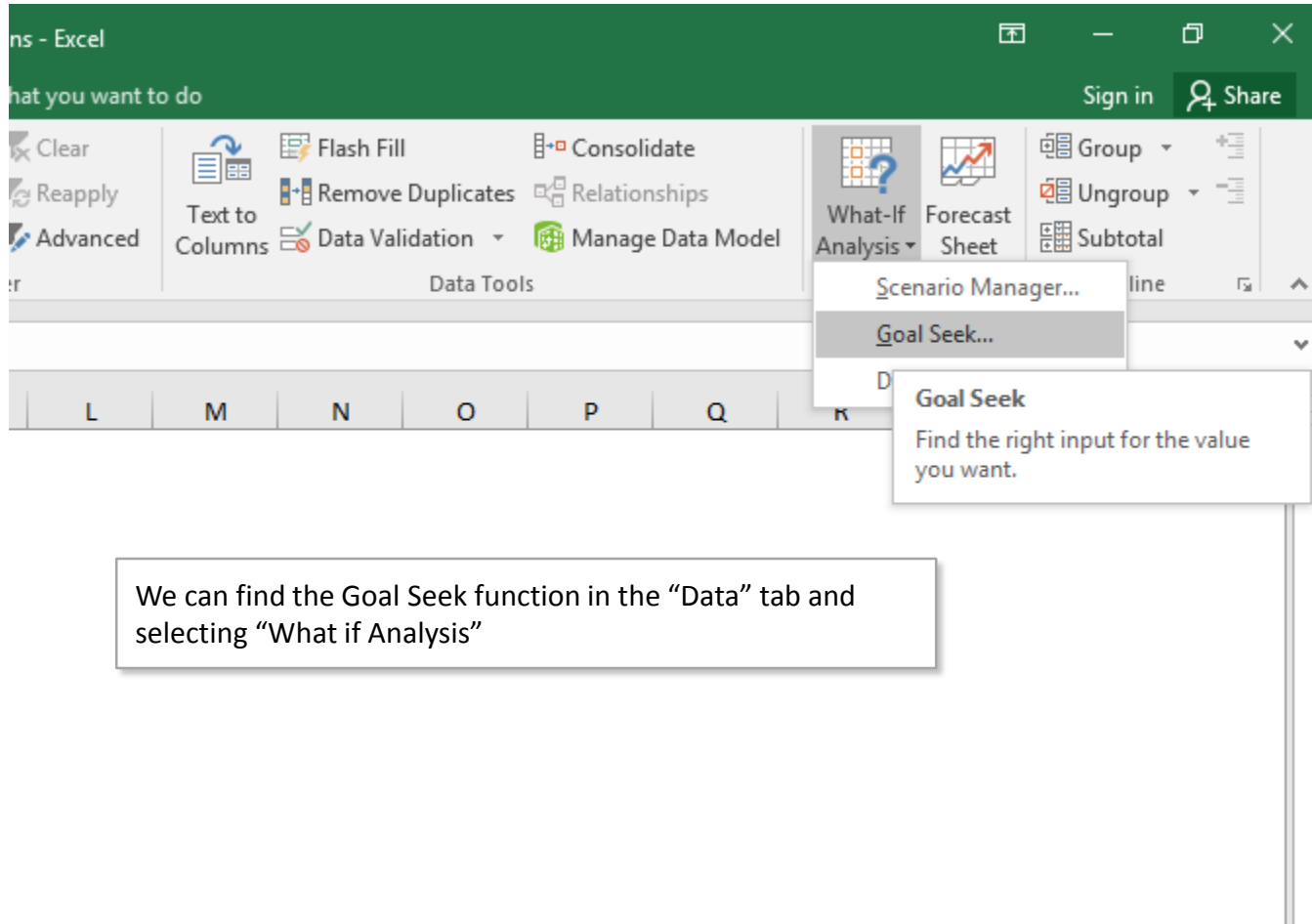


Goal seek

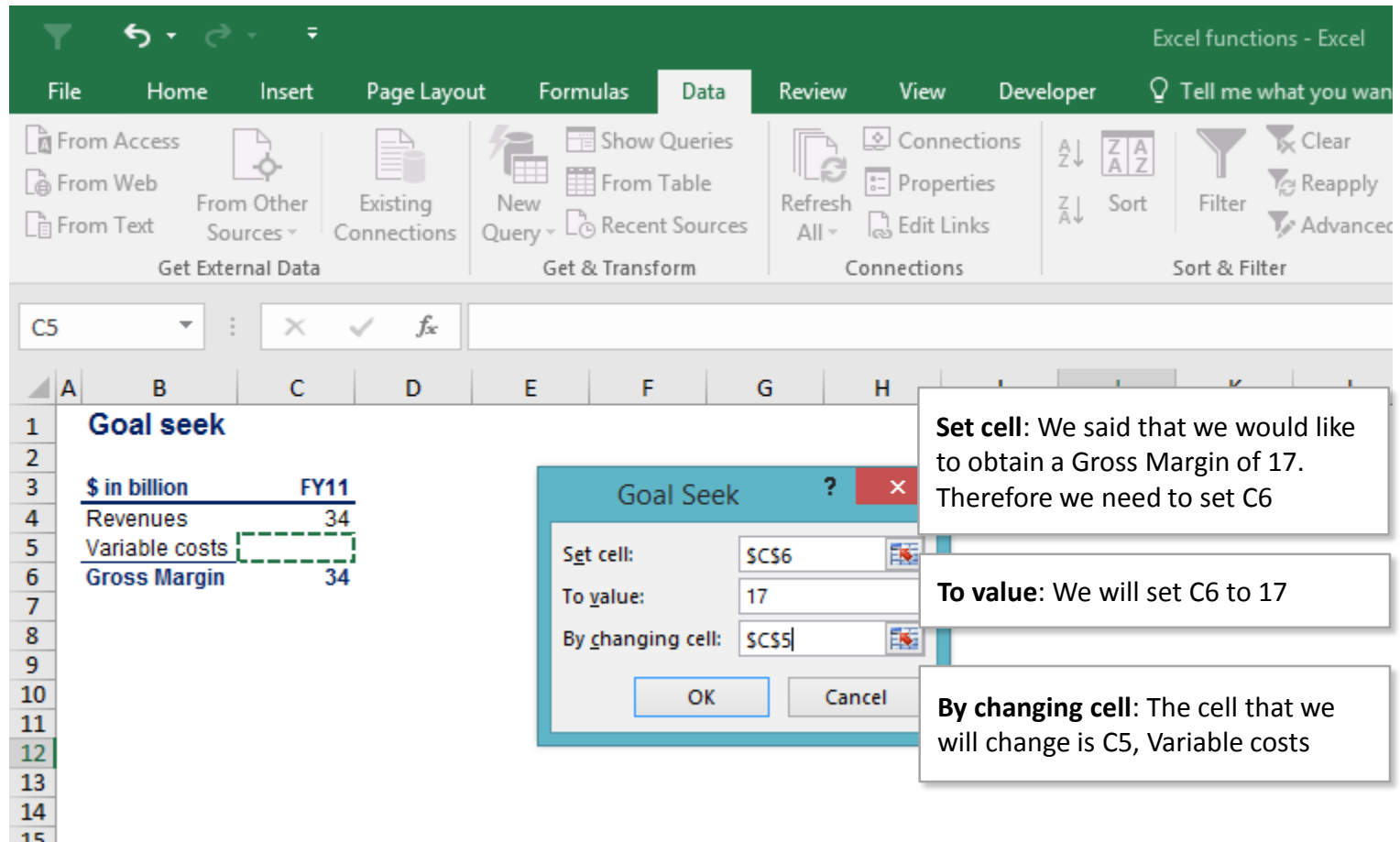
		FY11
Revenues		34
Variable costs		
Gross Margin		34

Goal Seek allows you to obtain an input that would result into a given level of output

For example, we would like to find how much will be Variable costs in order to obtain a Gross Margin of 17



We can find the Goal Seek function in the “Data” tab and selecting “What if Analysis”



The screenshot shows the Excel interface with the **Data** tab selected. The **Goal Seek** tool is open, and the following data is visible in the worksheet:

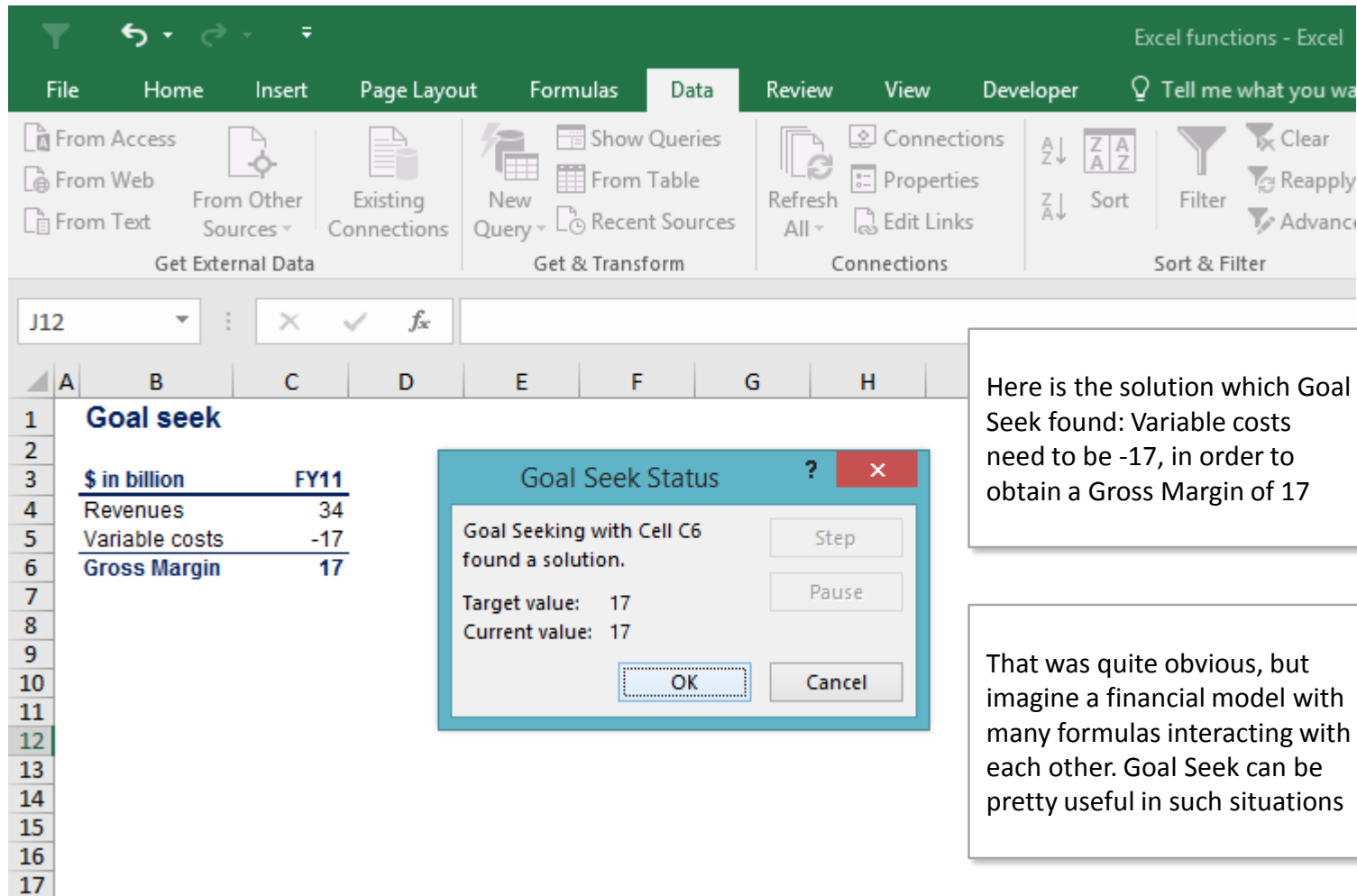
	\$ in billion	FY11
Revenues		34
Variable costs		
Gross Margin		34

The **Goal Seek** dialog box is configured as follows:

- Set cell:** \$C\$6
- To value:** 17
- By changing cell:** \$C\$5

Three callouts explain the components of the Goal Seek tool:

- Set cell:** We said that we would like to obtain a Gross Margin of 17. Therefore we need to set C6
- To value:** We will set C6 to 17
- By changing cell:** The cell that we will change is C5, Variable costs



The screenshot shows the Excel interface with the 'Data' ribbon selected. The worksheet contains a table with the following data:

	\$ in billion	FY11
Revenues	34	
Variable costs	-17	
Gross Margin		17

The 'Goal Seek Status' dialog box is open, showing the following information:

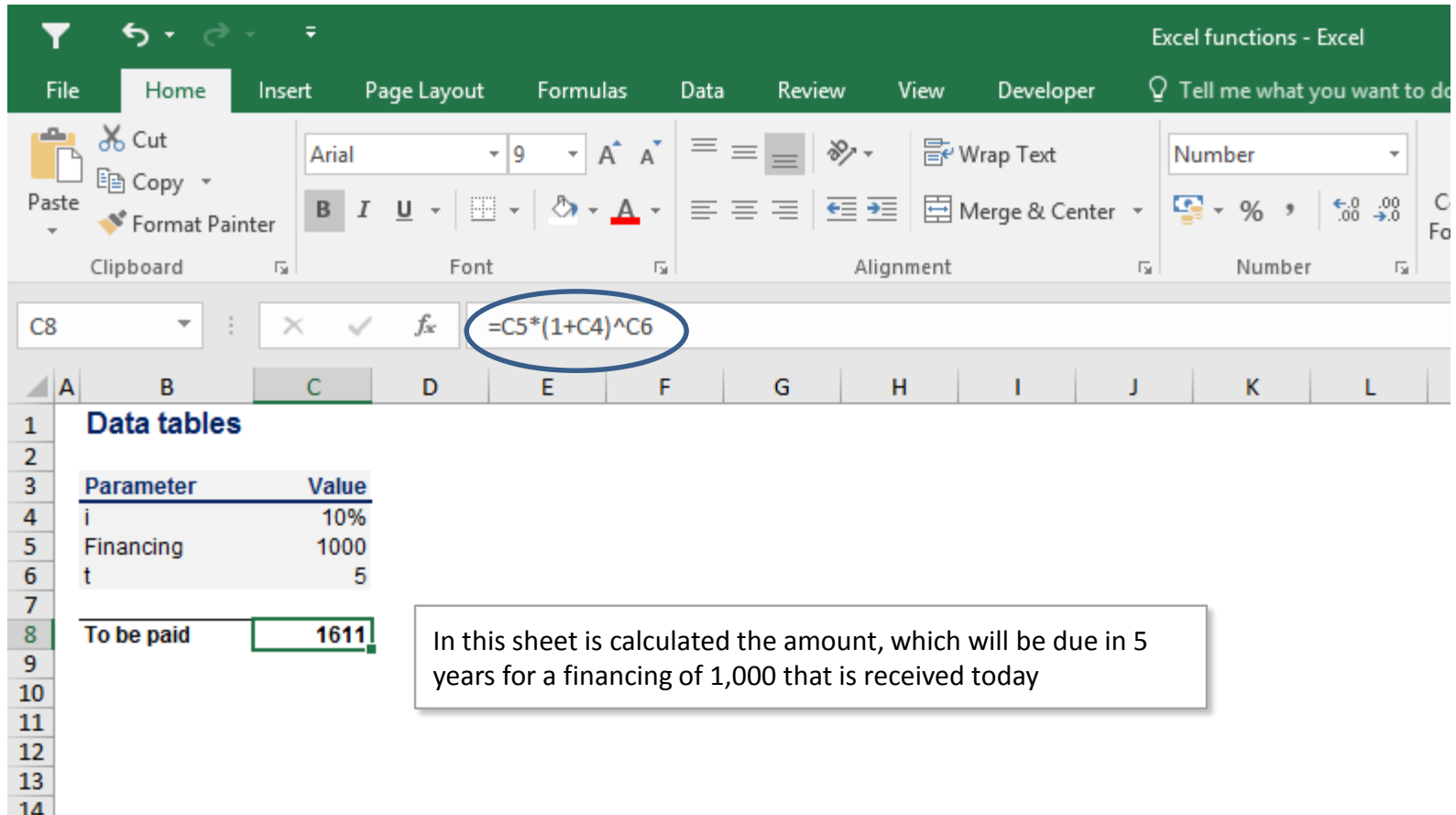
- Goal Seeking with Cell C6 found a solution.
- Target value: 17
- Current value: 17

Buttons in the dialog include Step, Pause, OK, and Cancel.

Here is the solution which Goal Seek found: Variable costs need to be -17, in order to obtain a Gross Margin of 17

That was quite obvious, but imagine a financial model with many formulas interacting with each other. Goal Seek can be pretty useful in such situations

Data tables

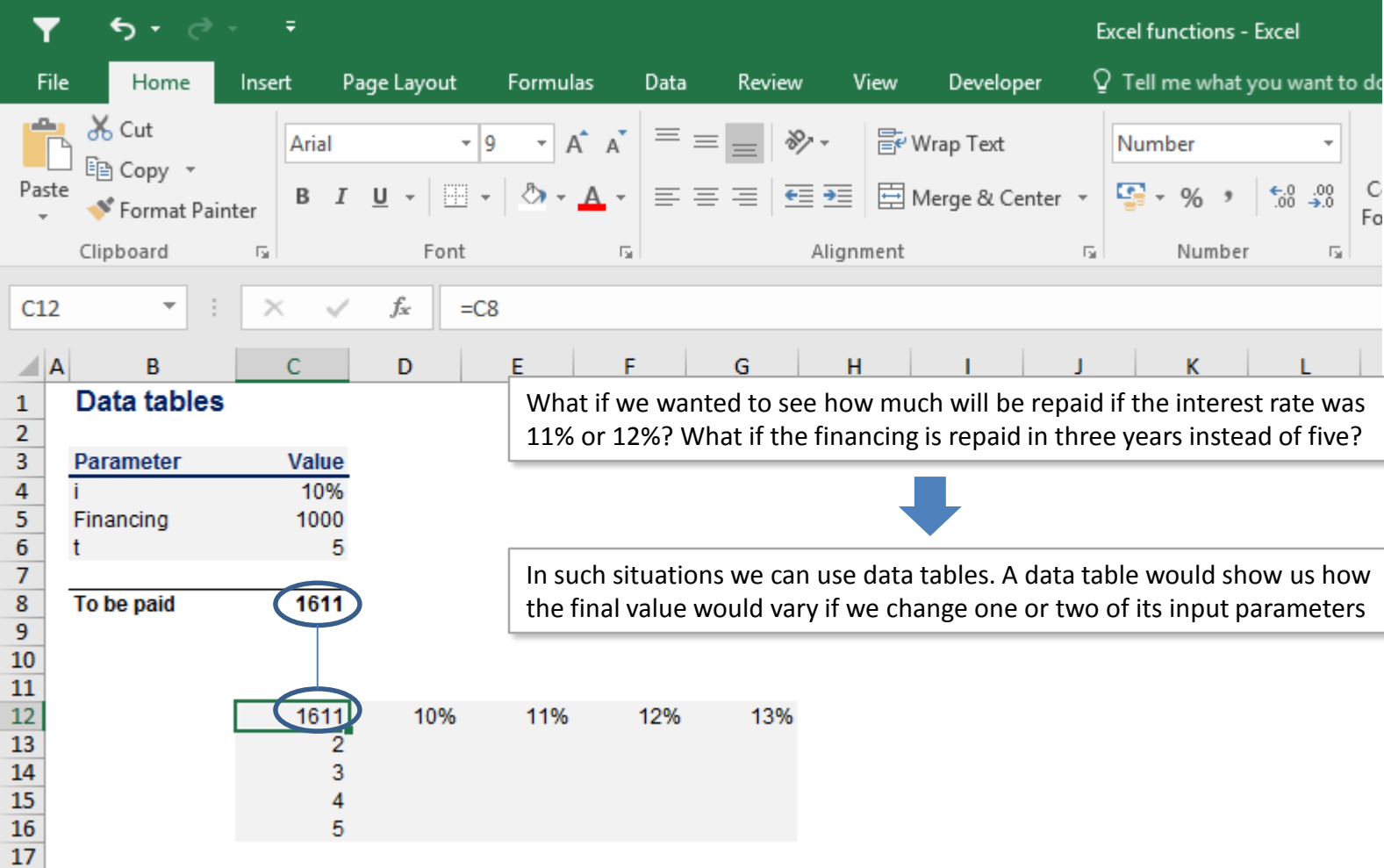


The screenshot shows the Microsoft Excel interface. The ribbon is set to 'Home'. The formula bar at the top displays the formula $=C5*(1+C4)^{C6}$, which is circled in blue. Below the formula bar, the spreadsheet grid is visible. In cell A1, the text 'Data tables' is written. In cell A3, a table is defined with two columns: 'Parameter' and 'Value'. The table contains three rows of data: 'i' with a value of '10%', 'Financing' with a value of '1000', and 't' with a value of '5'. In cell A8, the text 'To be paid' is written, and in cell B8, the value '1611' is displayed, which is the result of the formula in the formula bar.

Parameter	Value
i	10%
Financing	1000
t	5

To be paid 1611

In this sheet is calculated the amount, which will be due in 5 years for a financing of 1,000 that is received today



Excel functions - Excel

File Home Insert Page Layout Formulas Data Review View Developer Tell me what you want to do

Clipboard: Cut, Copy, Paste, Format Painter

Font: Arial, 9, Bold, Italic, Underline, Text Color, Background Color

Alignment: Wrap Text, Merge & Center

Number: Number, Percentage, Decimals

Formula bar: C12, =C8

Worksheet: A, B, C, D, E, F, G, H, I, J, K, L

Row numbers: 1 to 17

Data tables

Parameter	Value
i	10%
Financing	1000
t	5

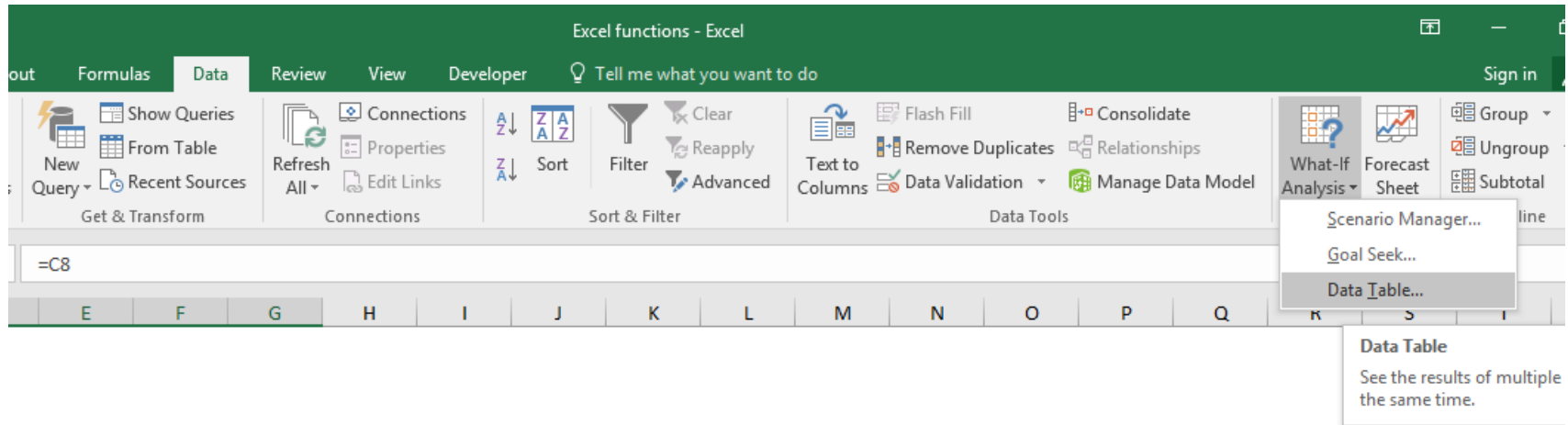
To be paid: 1611

	10%	11%	12%	13%
1611				
2				
3				
4				
5				

What if we wanted to see how much will be repaid if the interest rate was 11% or 12%? What if the financing is repaid in three years instead of five?

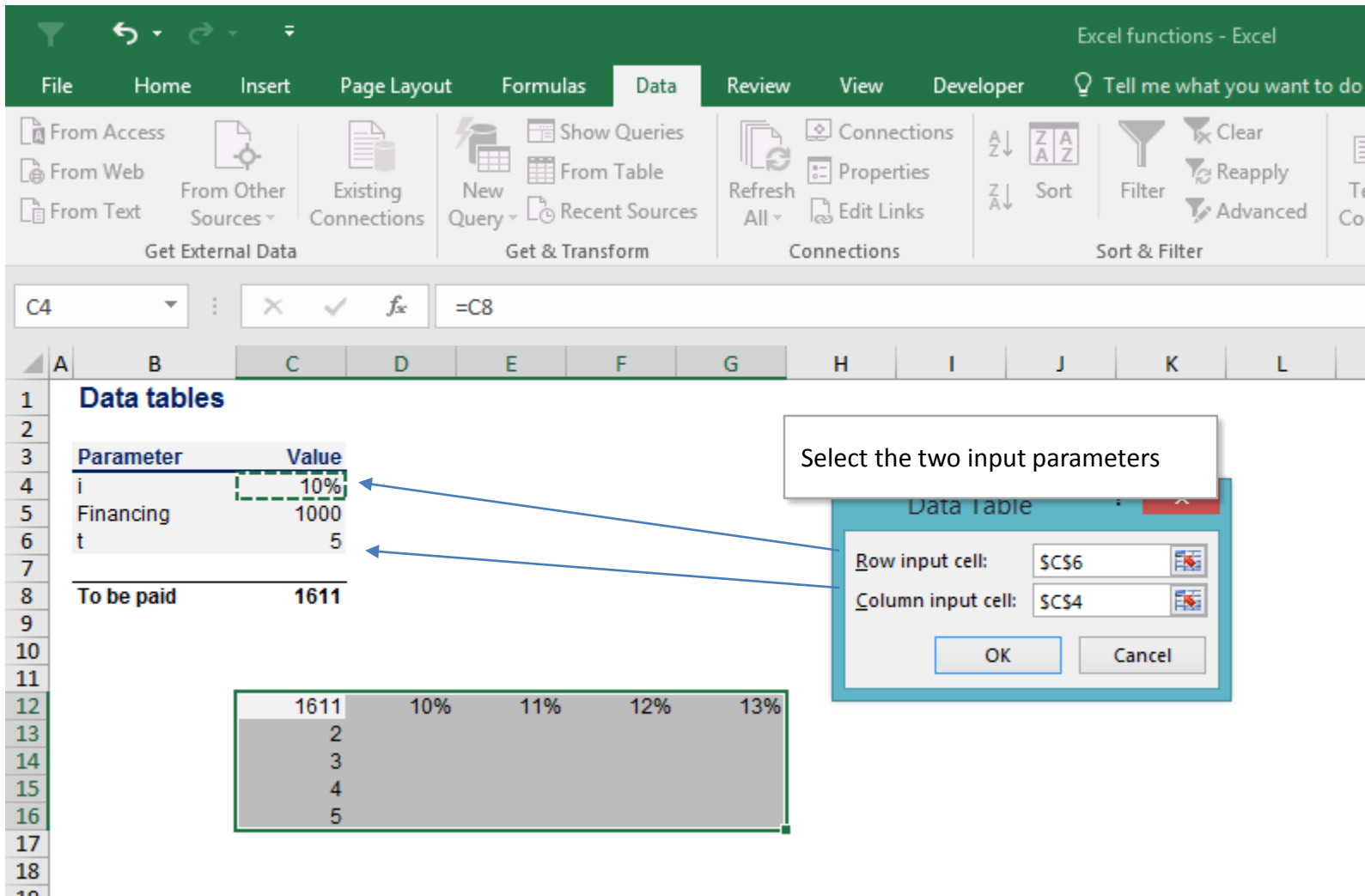
In such situations we can use data tables. A data table would show us how the final value would vary if we change one or two of its input parameters

DATA TABLES



Go to “What if Analysis” and select Data Table..

0%	11%	12%	13%



The screenshot shows the Microsoft Excel interface with the **Data** tab selected. The ribbon includes options for **Get External Data**, **Get & Transform**, **Connections**, and **Sort & Filter**. The formula bar shows $=C8$.

In the worksheet, a table is defined with the following data:

Parameter	Value
i	10%
Financing	1000
t	5
To be paid	1611

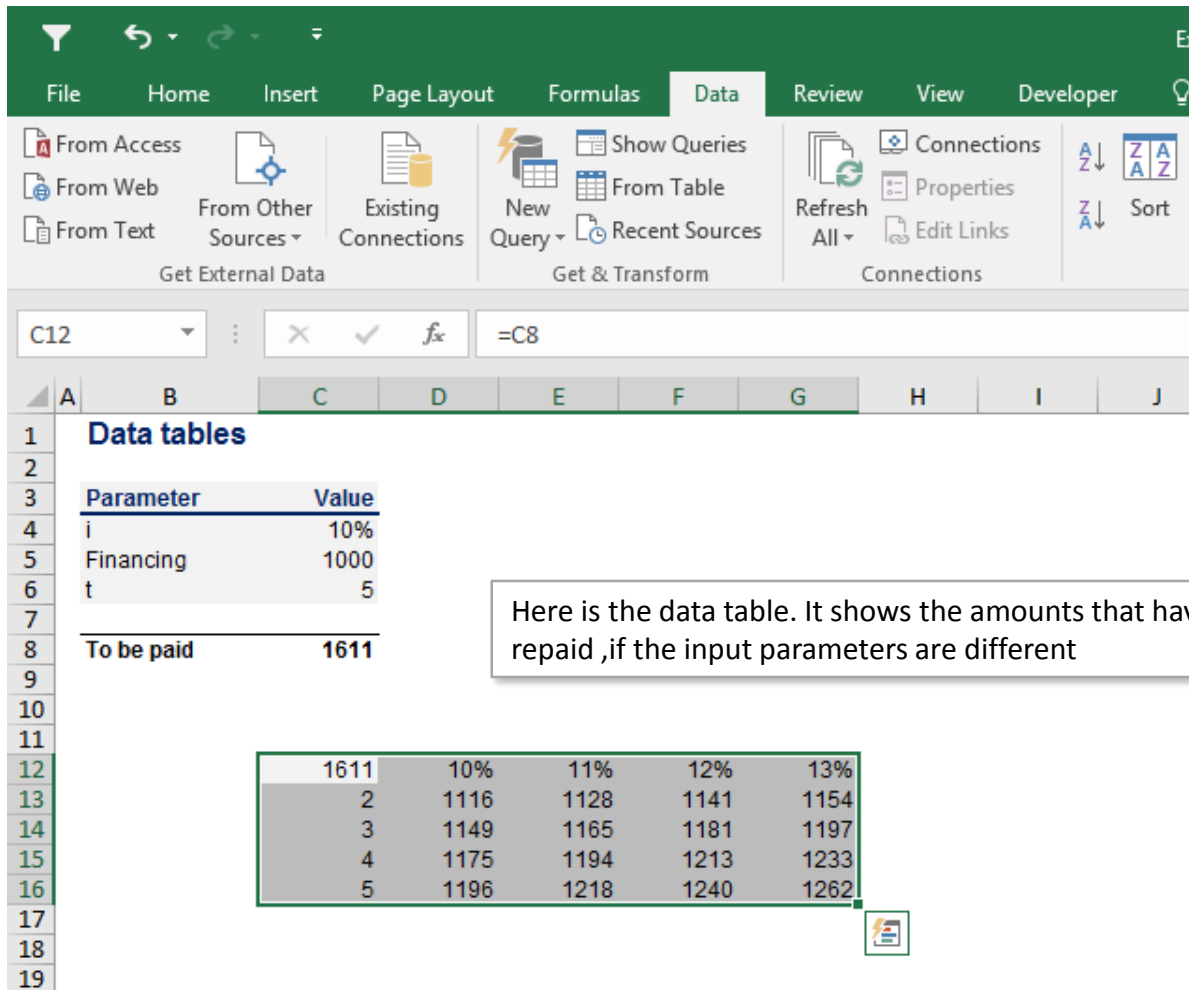
A callout box with the text "Select the two input parameters" points to the cells containing 10% and 5. The **Data Table** dialog box is open, showing the following settings:

- Row input cell:** $\$C\6
- Column input cell:** $\$C\4

The dialog box also has **OK** and **Cancel** buttons.

Below the table, a data table array is shown, which is a grid of values resulting from the data table calculation:

1611	10%	11%	12%	13%
2				
3				
4				
5				



The screenshot shows the Microsoft Excel interface with the **Data** tab selected on the ribbon. The ribbon includes groups for **Get External Data** (From Access, From Web, From Text, From Other Sources), **Get & Transform** (New Query, Show Queries, From Table, Recent Sources), **Connections** (Refresh All, Connections, Properties, Edit Links), and **Sort** (Sort, Sort & Filter). The formula bar shows **=C8**. The worksheet contains a data table with the following structure:

Parameter	Value
i	10%
Financing	1000
t	5
To be paid	1611

A callout box states: "Here is the data table. It shows the amounts that have to be repaid ,if the input parameters are different". Below the data table, a data table is shown with the following values:

1611	10%	11%	12%	13%
2	1116	1128	1141	1154
3	1149	1165	1181	1197
4	1175	1194	1213	1233
5	1196	1218	1240	1262

Pivot tables

Excel functions - Excel

File Home Insert Page Layout Formulas **Data** Review View Developer Tell me what you want to do

From Access From Web From Other Sources Existing Connections New Query Show Queries From Table Refresh Connections Properties Sort Filter Clear Reapply Text to Columns

Get External Data

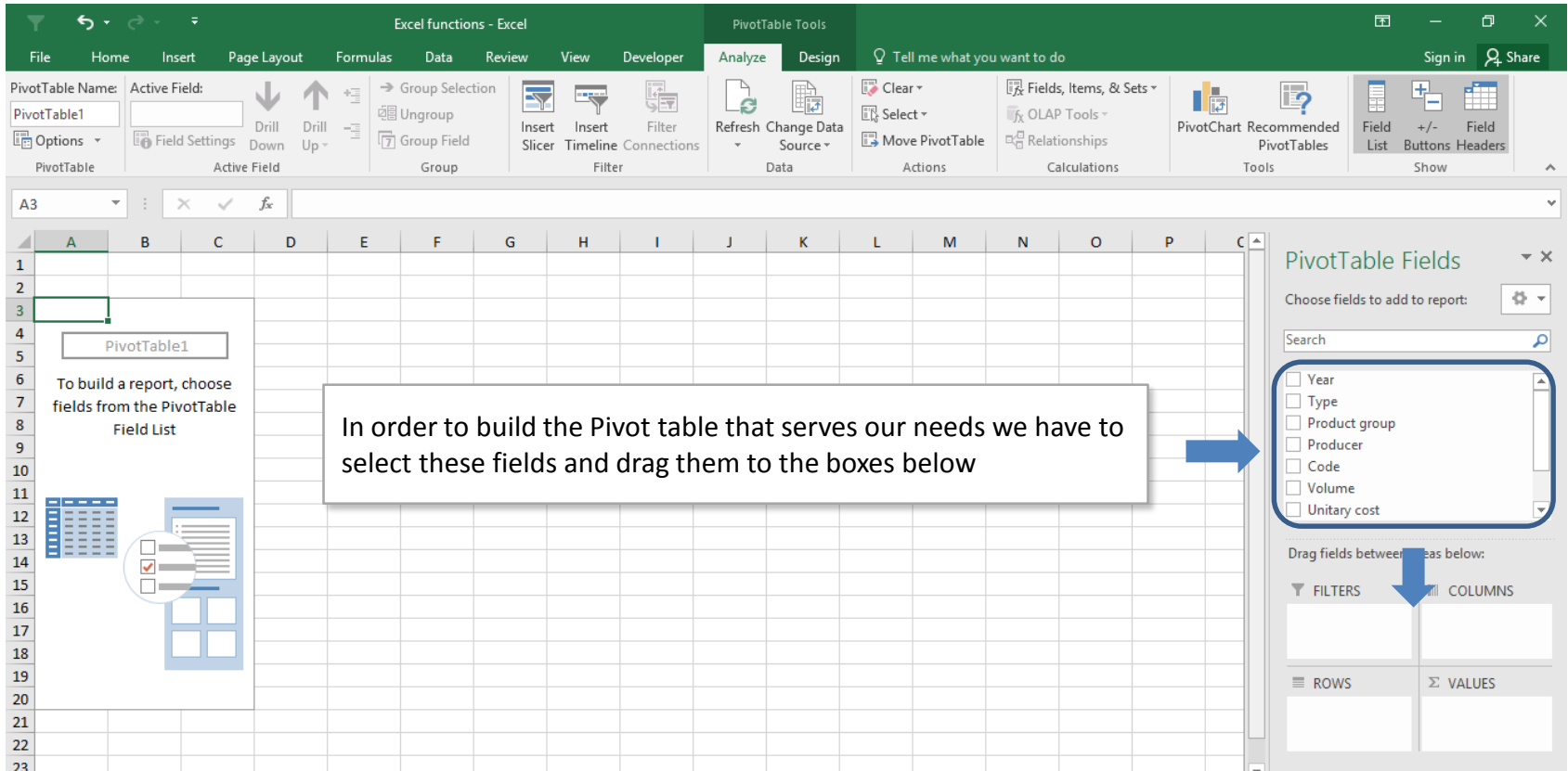
B3

Pivot tables are Excel's dynamic and interactive tables. The data that you see on this sheet includes 15,000 rows and could be hard to elaborate. Pivot tables are a great way to simplify the work with large quantities of data

	Year	Type	Product group	Producer	Code	Volume	Unitary cost	Unitary price
1	Pivot tables							
2								
3	2011	Convenience stores	Drinks	San Benedetto	[13/01/01]	4836	0.74	0.96
4	2011	Convenience stores	Drinks	San Benedetto	[13/01/01a]	5928	0.95	0.99
5	2011	Convenience stores	Drinks	San Benedetto	[13/01/02]	5712	0.89	0.97
6	2011	Convenience stores	Drinks	San Benedetto	[13/01/03]	4872	0.62	0.9
7	2011	Convenience stores	Drinks	San Benedetto	[13/01/04]	6228	0.65	1.07
8	2011	Convenience stores	Drinks	San Benedetto	[13/01/05]	9588	0.92	1.01
9	2011	Convenience stores	Drinks	San Benedetto	[13/01/06]	7836	1.19	0.96
10	2011	Convenience stores	Drinks	San Benedetto	[13/01/07]	7560	1.02	1.09
11	2011	Convenience stores	Drinks	San Benedetto	[13/01/30]	8556	0.99	1.1
12	2011	Convenience stores	Drinks	San Benedetto	[13/11/01]	9024	0.51	1.15
13	2011	Convenience stores	Drinks	San Benedetto	[13/11/01a]	7260	1.04	0.98
14	2011	Convenience stores	Drinks	San Benedetto	[13/11/02]	9456	0.85	1.17
15	2011	Convenience stores	Drinks	San Benedetto				

The screenshot shows the Microsoft Excel interface with the 'Data' tab selected. The ribbon includes options for 'Get External Data' (From Access, From Web, From Text, From Other Sources, Existing Connections, New Query, Recent Sources), 'Connections' (Show Queries, From Table, Refresh All, Properties, Edit Links), 'Sort' (Z-A, A-Z), 'Filter' (Filter, Clear, Reapply, Advanced), and 'Text to Columns'. A tooltip is displayed over the 'Data' tab, stating: 'In order to create a Pivot table, select all of the rows that you would like to include in it (including the titles of the table)'. Another tooltip is displayed over the 'Insert' tab, stating: 'Go to the "Insert" tab and select "Pivot table"'. The background shows a Pivot table with the following data:

	Year	Store Type	Product Category	Brand	Date	Units Sold	Price per Unit	Total Sales
15094	2013	Convenience stores	Cosmetics	Sephora	[01/01/32]	276	4.07	5.25
15095	2013	Convenience stores	Cosmetics	Sephora	[01/01/33]	404	4.87	5.24
15096	2013	Convenience stores	Cosmetics	Sephora	[01/01/34]	20	4.25	5.35
15097	2013	Convenience stores	Cosmetics	Sephora	[01/01/35]	336	4.12	5.1
15098	2013	Convenience stores	Cosmetics	Sephora	[01/01/36]	684	4.95	5.36
15099	2013	Convenience stores	Cosmetics	Sephora	[01/01/37]	480	4.45	5.25
15100	2013	Convenience stores	Cosmetics	Sephora	[01/01/38]	252	4.81	5.04
15101	2013	Convenience stores	Cosmetics	Sephora	[01/01/39]	696	4.78	5.11
15102	2013	Convenience stores	Cosmetics	Sephora	[01/01/40]	432	4.36	5.15
15103	2013	Convenience stores	Cosmetics	Sephora	[01/01/41]	360	4.49	5.13
15104	2013	Convenience stores	Cosmetics	Sephora	[01/01/42]	372	4.69	5.05
15105	2013	Convenience stores	Coffee	Jacobs	[11/01/01]	5772	0.66	1.09
15106	2013	Convenience stores	Coffee	Jacobs	[11/02/01]	9576	0.72	1.03
15107	2013	Convenience stores	Sweets	Sapori di Siena	[76/01/01]	1212	1.47	1.62
15108	2013	Convenience stores	Sweets	Sapori di Siena	[76/01/02]	684	1.37	1.9
15109	2013	Convenience stores	Sweets	Sapori di Siena	[76/01/03]	996	1.18	1.81
15110	2013	Convenience stores	Sweets	Sapori di Siena	[76/01/04]	852	1.16	1.8
15111	2013	Convenience stores	Sweets	Sapori di Siena	[76/01/05a]	756	1.48	1.75
15112	2013	Convenience stores	Sweets	Sapori di Siena	[76/01/06a]	636	1.29	1.72
15113	2013	Convenience stores	Beverages	TIP	[26/01/04]	60	1.03	1.33
15114	2013	Supermarkets	Vegetables	Monzuro	[102/01/01]	1524	0.76	1.19



The screenshot shows the Microsoft Excel interface with the **PivotTable Tools** ribbon active. The ribbon includes tabs for **Analyze** and **Design**. The **Analyze** tab is currently selected, showing options like **Refresh**, **Change Data Source**, **Clear**, **Select**, **Move PivotTable**, **Fields, Items, & Sets**, **OLAP Tools**, **Relationships**, **PivotChart**, **Recommended PivotTables**, **Field List**, **+/- Buttons**, and **Field Headers**.

The **PivotTable Fields** task pane is open on the right side of the screen. It contains a search bar and a list of fields to add to the report: ☐ Year, ☐ Type, ☐ Product group, ☐ Producer, ☐ Code, ☐ Volume, and ☐ Unitary cost. Below the list, there are four boxes for organizing the fields: **FILTERS**, **COLUMNS**, **ROWS**, and **VALUES**. A blue arrow points from the text box to the **FILTERS** box.

PivotTable Name: PivotTable1
Active Field: [Empty]

Field List: PivotTable

Active Field: [Empty]

Group Selection: Group Selection, Ungroup, Group Field

Filter: Insert Slicer, Insert Timeline, Filter Connections

Data: Refresh, Change Data Source

Actions: Clear, Select, Move PivotTable

Calculations: Fields, Items, & Sets, OLAP Tools, Relationships

Tools: PivotChart, Recommended PivotTables

Show: Field List, +/- Buttons, Field Headers

PivotTable Fields

Choose fields to add to report:

Search

- ☐ Year
- ☐ Type
- ☐ Product group
- ☐ Producer
- ☐ Code
- ☐ Volume
- ☐ Unitary cost

Drag fields between areas below:

FILTERS **COLUMNS**

ROWS **VALUES**

To build a report, choose fields from the PivotTable Field List

In order to build the Pivot table that serves our needs we have to select these fields and drag them to the boxes below

PivotTable Fields

Choose fields to add to report:

- ☒ Year
- ☐ Type
- ☒ Product group
- ☐ Producer
- ☐ Code
- ☒ Volume
- ☐ Unitary cost

Drag fields between areas below:

FILTERS

COLUMNS

Year

ROWS

Product group

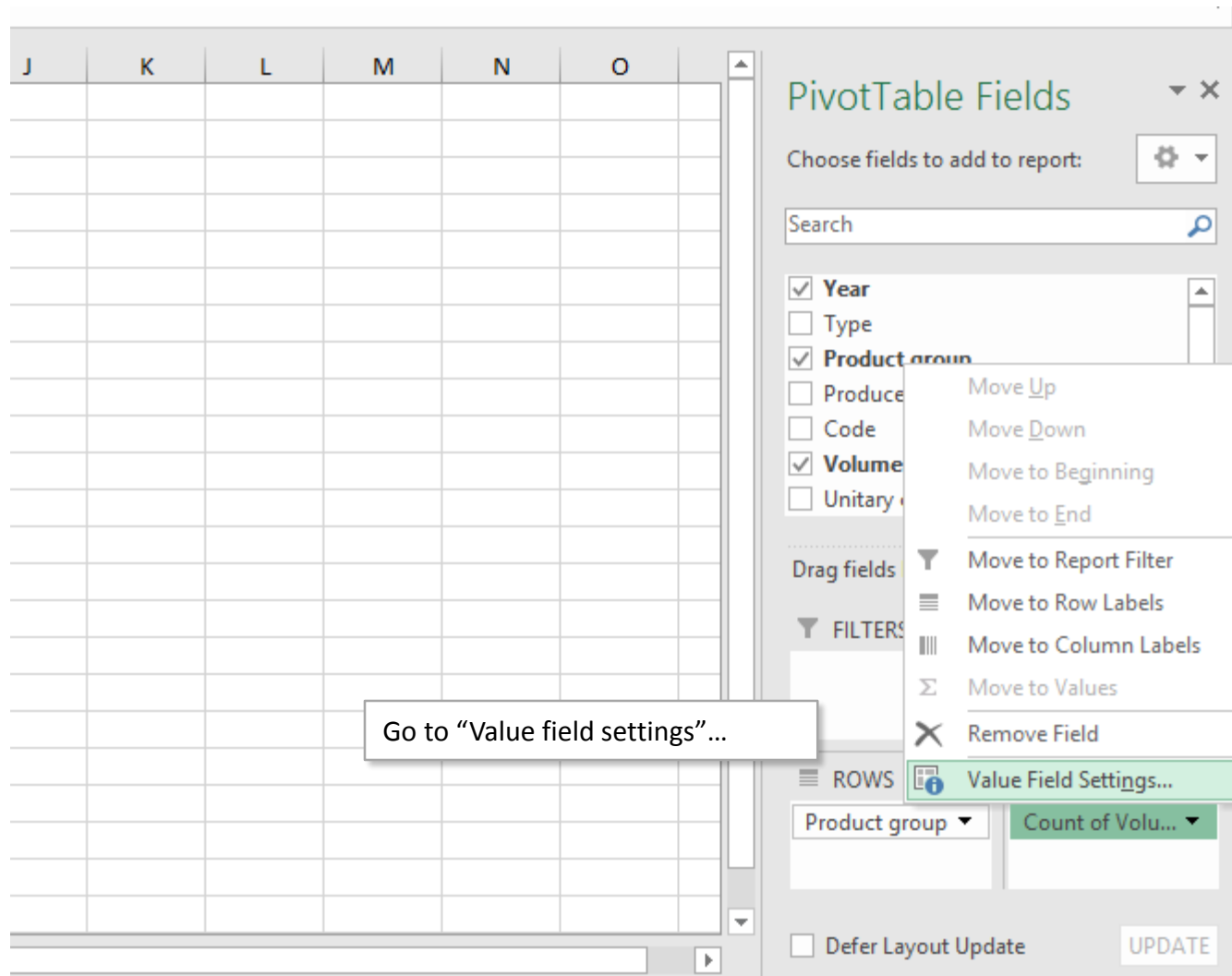
VALUES

Count of Volume...

We have to select what type of operation needs to be carried out for given fields

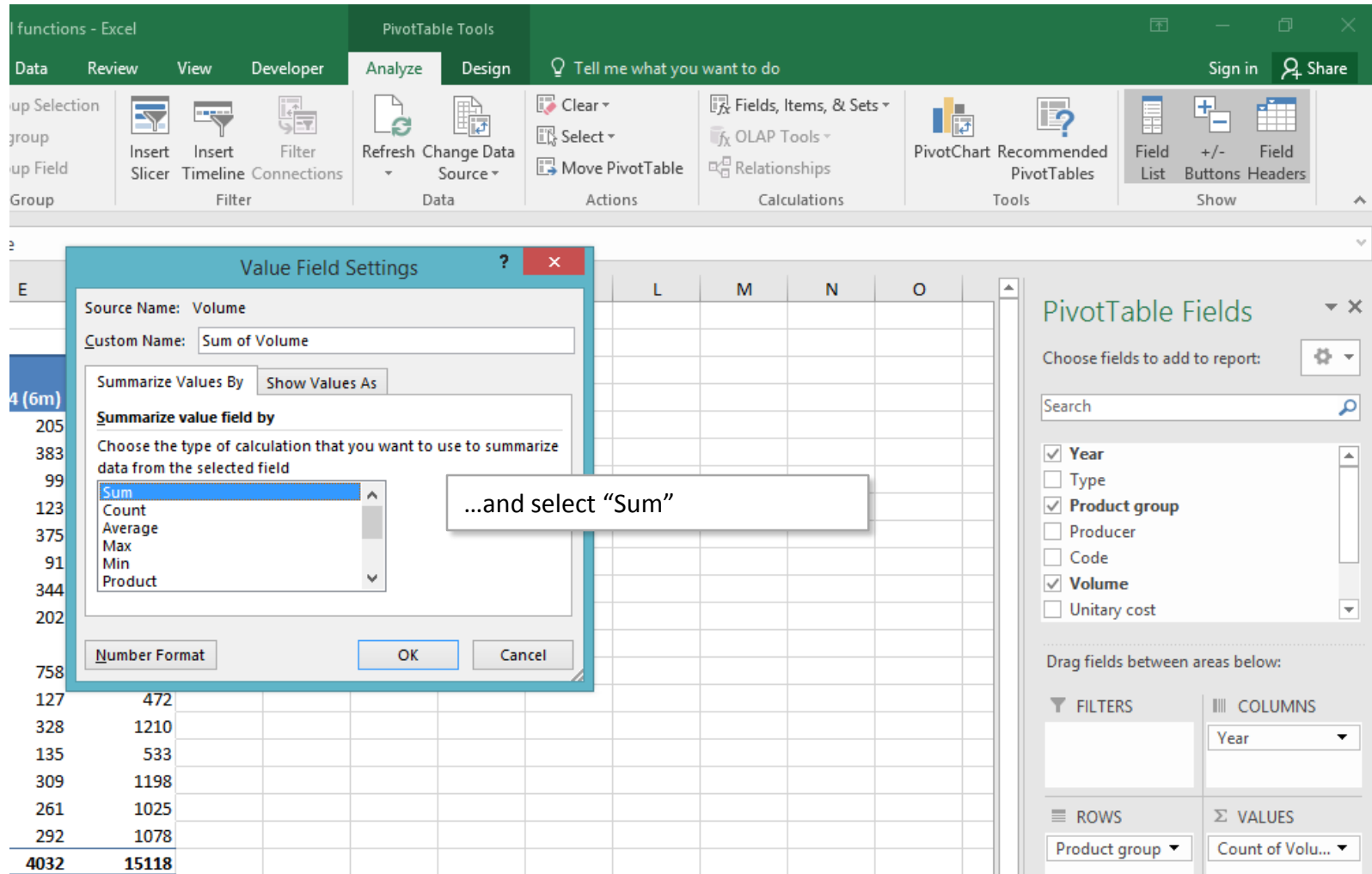
In this example Excel counts the "Volume" cells. In each of them we have the actual volume figures and therefore we would like these cells to be summed

Product Labels	2011	2012	2013	2014 (6m)	Grand Total
Alcohol	136	168	194	205	703
Beverages	361	370	371	383	1485
Bread products	70	73	83	99	325
Cheese products	108	108	122	123	461
Coffee	264	350	364	375	1353
Corn flakes	70	82	90	91	333
Cosmetics	298	319	343	344	1304
Delicatessen	189	199	199	202	789
Drinks	79				79
Fresh salads	597	673	742	758	2770
Homecare products	111	112	122	127	472
Ice cream	287	290	305	328	1210
Meat	130	134	134	135	533
Sauces	287	301	301	309	1198
Sweets	249	256	259	261	1025
Vegetables	242	263	281	292	1078
Grand Total	3478	3698	3910	4032	15118



The screenshot shows the Excel PivotTable Fields task pane on the right side of the worksheet. The worksheet grid is visible on the left, with columns J through O. The task pane is titled "PivotTable Fields" and contains a list of fields: Year, Type, Product group, Code, Volume, and Unitary. The "Volume" field is selected, and a context menu is open over it, showing options: Move Up, Move Down, Move to Beginning, Move to End, Move to Report Filter, Move to Row Labels, Move to Column Labels, Move to Values, and Remove Field. The "Move to Values" option is highlighted. Below the list, the "Drag fields" section shows "Product group" in the "FILTERS" area and "Volume" in the "ROWS" area. The "Value Field Settings" button is also visible. A callout box points to the "Value Field Settings" button with the text "Go to 'Value field settings'...".

Go to "Value field settings"...



The screenshot shows the Microsoft Excel interface with the PivotTable Tools ribbon active. The 'Analyze' tab is selected, showing options like Refresh, Change Data Source, and Move PivotTable. The 'Design' tab is also visible. The 'Value Field Settings' dialog box is open, showing the source name 'Volume' and the custom name 'Sum of Volume'. The 'Summarize Values By' section is set to 'Show Values As', and the 'Summarize value field by' list has 'Sum' selected. A callout box points to the 'Sum' option in the list with the text '...and select "Sum"'. The 'PivotTable Fields' task pane is on the right, showing a list of fields: Year, Type, Product group, Producer, Code, Volume, and Unitary cost. The 'Volume' field is checked. Below the list, the 'Drag fields between areas below:' section shows the 'FILTERS' area empty, the 'COLUMNS' area with 'Year', the 'ROWS' area with 'Product group', and the 'VALUES' area with 'Count of Volume'.

Value Field Settings

Source Name: Volume

Custom Name: Sum of Volume

Summarize Values By: Show Values As

Summarize value field by

Choose the type of calculation that you want to use to summarize data from the selected field

- Sum
- Count
- Average
- Max
- Min
- Product

...and select "Sum"

PivotTable Fields

Choose fields to add to report:

Search

- ☒ Year
- ☐ Type
- ☒ Product group
- ☐ Producer
- ☐ Code
- ☒ Volume
- ☐ Unitary cost

Drag fields between areas below:

FILTERS

COLUMNS

Year

ROWS

Product group

VALUES

Count of Volume

Excel functions - Excel

PivotTable Tools: Analyze, Design, Tell me what you want to do

PivotTable Name: PivotTable1, Active Field: Sum of Volume

Options: PivotTable, Field Settings, Drill Down, Drill Up, Group Selection, Ungroup, Group Field, Insert Slicer, Insert Timeline, Filter Connections, Refresh, Change Data Source, Clear, Select, Move PivotTable

Formula Bar: A3, Sum of Volume

	A	B	C	D	E	F	G	H	I	J	K	L
1												
2												
3	Sum of Volume	Column Labels										
4	Row Labels	2011	2012	2013								
5	Alcohol	222612	315756	384504								
6	Beverages	39624	49608	52200								
7	Bread products	125700	126996	150924	178290	581916						
8	Cheese products	40656	37776	43692	42888	165012						
9	Coffee	2566308	2716272	9674580								
10	Corn flakes	44256	43188	160452								
11	Cosmetics	165888	163884	617796								
12	Delicatessen	85692	88404	90132	91188	355416						
13	Drinks	560892				560892						
14	Fresh salads	541932	603456	671616	682692	2499696						
15	Homecare products	88080	90144	91968	100608	370800						

The Pivot table displays the Volumes per each product category and for each of the years